Interim Session, American College of Chest Physicians
Ambassador Hotel, Los Angeles, California, December 2 and 3, 1951

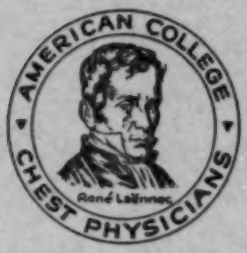
VOLUME XX NUMBER 5

DISEASES

of the

CHEST

OFFICIAL PUBLICATION



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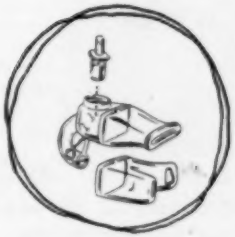

1. Krasno, L., and Rhoads, P. (1949), The Inhalation of Penicillin Dust, Amer. Prac., 11:649, July.

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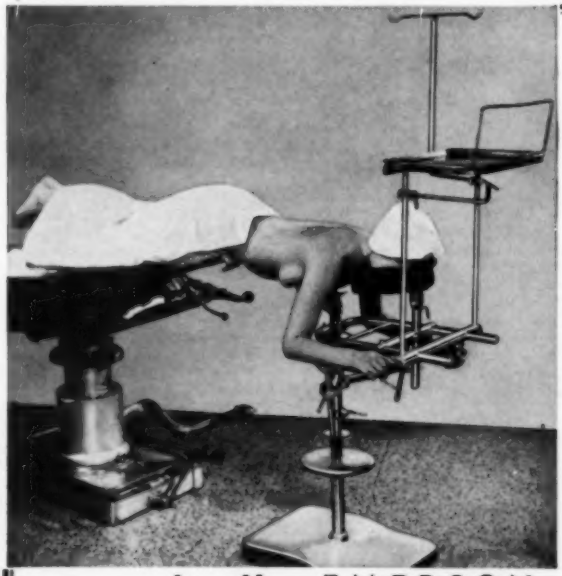

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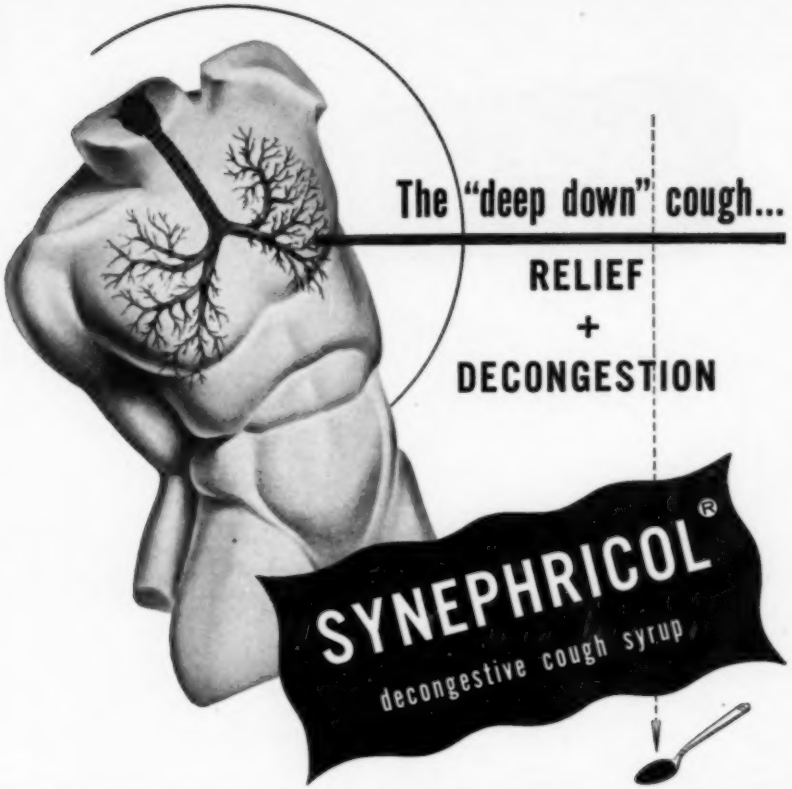

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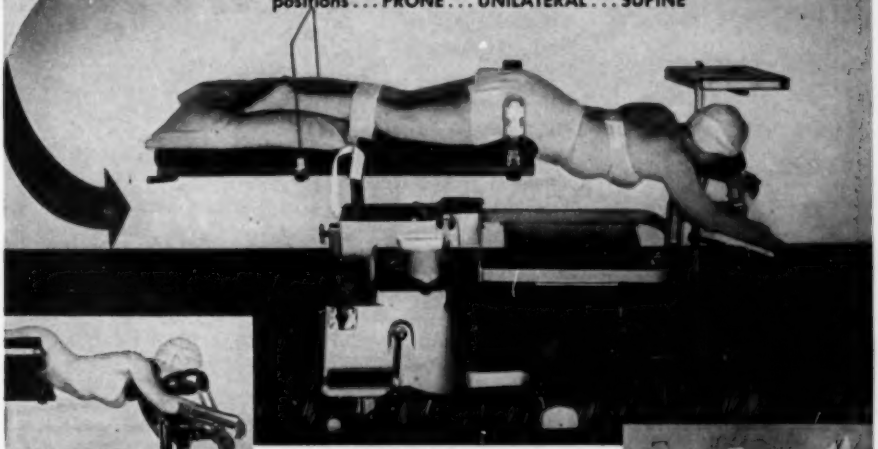

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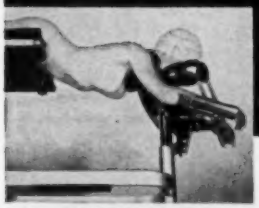

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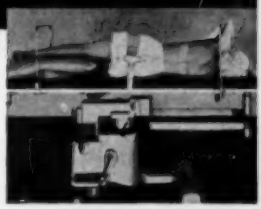

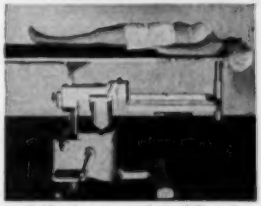

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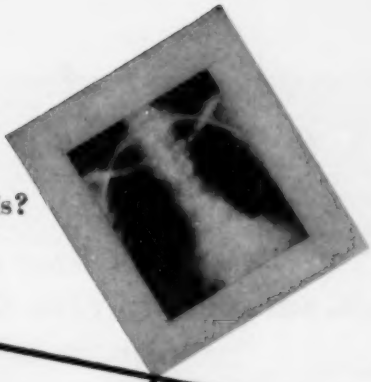

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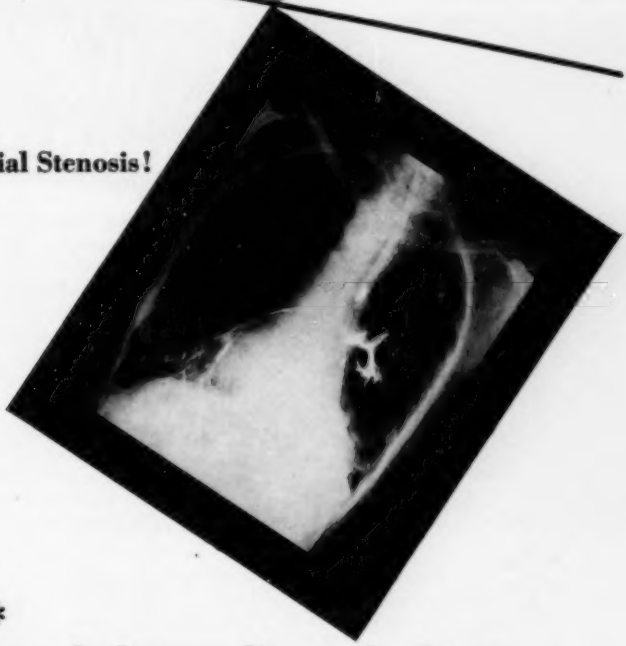

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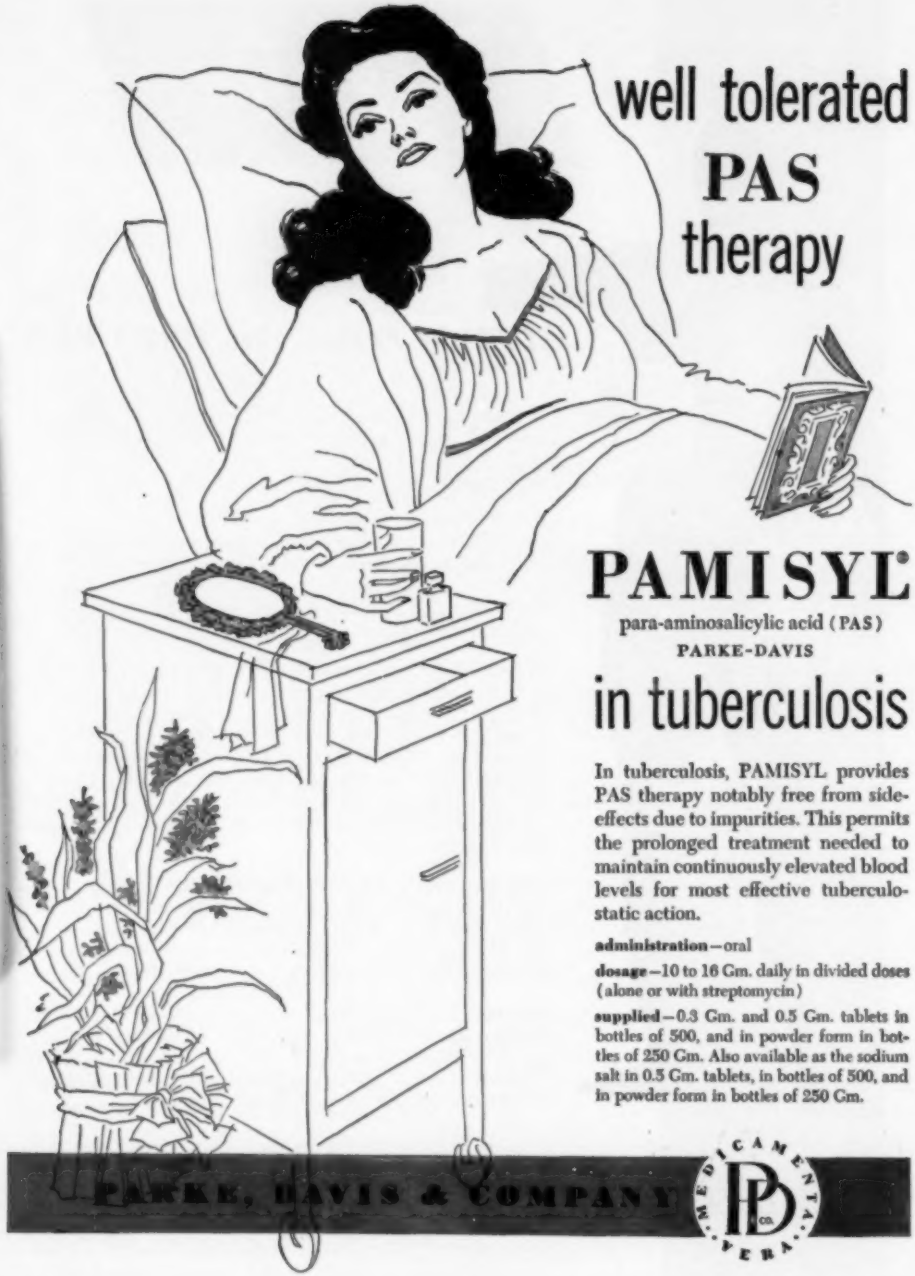

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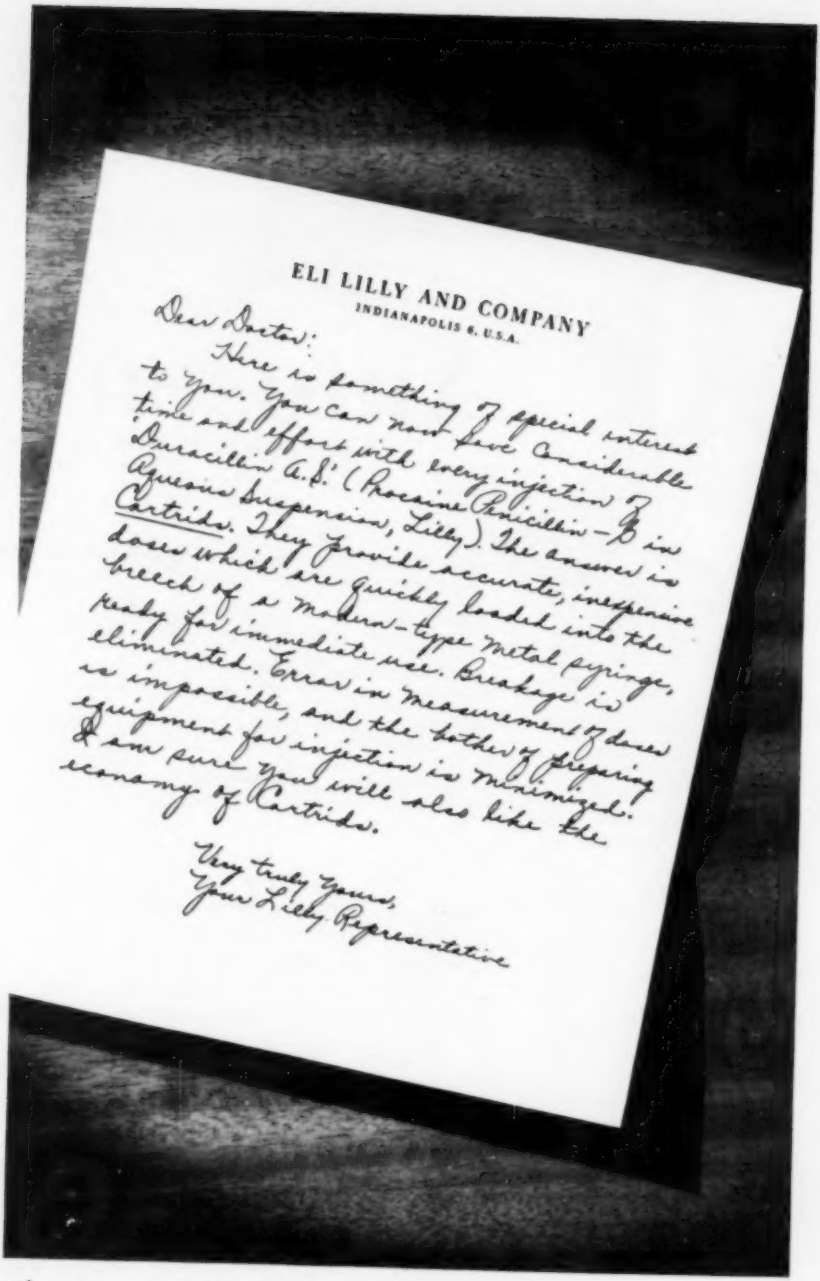
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DISEASES *of the* CHEST

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The Surgery of Valvular Heart Disease*

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The surgery of valvular heart disease is in its very infancy. Yet, already significant strides have been made in the correction of valvular lesions, especially the stenotic ones.

Tricuspid Valve

The tricuspid valve is rarely seriously affected except in cases of congenital atresia with an associated hypoplastic right ventricle. In such cases there is always a wide-open interauricular septal defect and the pulmonary artery arises either from the left ventricle or from the rudimentary right ventricle. Usually there is an associated pulmonary stenosis, and it is this lesion which requires surgical treatment. It will, therefore, be discussed under the subject of pulmonary stenosis (Figure 1).

Aortic Valve

Aortic stenotic and regurgitant lesions are most difficult to treat, mainly because of the serious associated dysfunction of the coronary circulation. These patients live in a precarious state of balance among their physiological disturbances and adjustments. Relatively slight additional stress is, therefore, sufficient to throw them into complete decompensation and leads to prompt death. We have, however, been able to improve or palliate a number of cases of severe aortic stenosis to date, by simple mechanical dilatation.[1] However, the entire subject of aortic valve surgery is presently under intensive scrutiny and investigation. Probably it would be best to defer discussion of these lesions until the pertinent surgical features are better understood (Figure 2).

*The experimental and clinical work basic to this article was partly supported by Grant H-394 of the U. S. Public Health Service.

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Pulmonary Valve

The pulmonary valve lesion which is clinically encountered is congenital stenosis. It may be presented as a single lesion, or may be part of a more complex defect or syndrome such as tetralogy of Fallot. "Pure" or single pulmonic stenosis is unassociated with cyanosis unless an atrial septal defect is present, since all the right ventricular outflow must pass through the pulmonary artery and into the lungs. The difficulty is with the expulsion of the right ventricular outflow producing dyspnea upon exertion and eventual right heart failure.

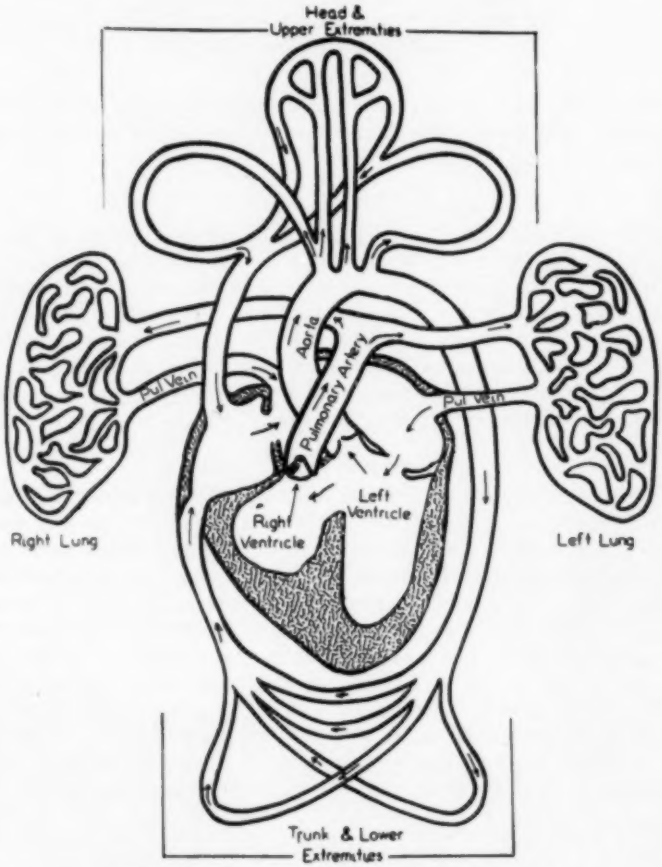


FIGURE 1: Tricuspid atresia with pulmonary stenosis.

Congenital pulmonary stenosis with a high interventricular septal defect and an overriding aorta produces the syndrome known as tetralogy of Fallot—the common garden variety of the "blue baby" condition. There is always a right-to-left shunt in such cases with admixture of unoxygenated venous blood in the aorta (Figure 3). Such patients are cyanotic from birth with clubbing of the fingers and toes and suffusion of the conjunctivae. They are unable to indulge in physical exertion. Polycythemia may reach 9,000,000 red cells. The arterial oxygen saturation ranges from 30 to 70 per cent but drops precipitously upon the least exertion. These patients become weak and faint on exertion, requiring squatting or lying down. Some become unconscious and even convulsive. There is a systolic cardiac murmur in a rhythmic heart.

X-ray film reveals a small or normal-sized heart, often with a "boot-like" elevation of the apex (due to hypertrophy of the right ventricle). Lung fields are sometimes clear of vascular markings, especially toward the periphery.

These cases may be treated by the creation of an artificial patent ductus arteriosus either by the Blalock (subclavian artery-pulmonary artery end-to-side anastomosis[2]) or the Potts (aorta-to-pulmonary artery side-to-side anastomosis[3]) technique. This results in great improvement of all symptoms, but adds another

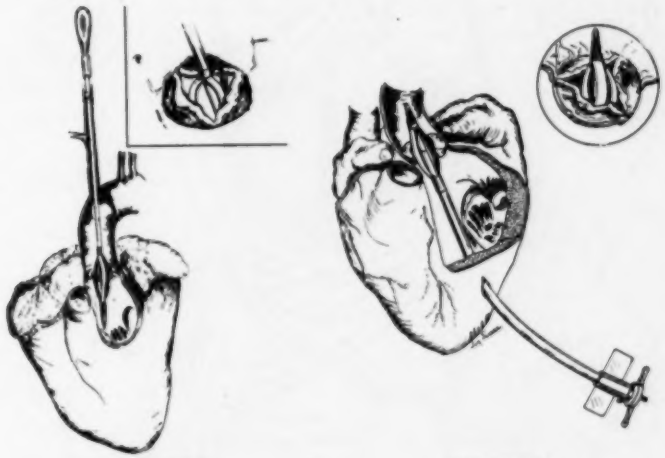


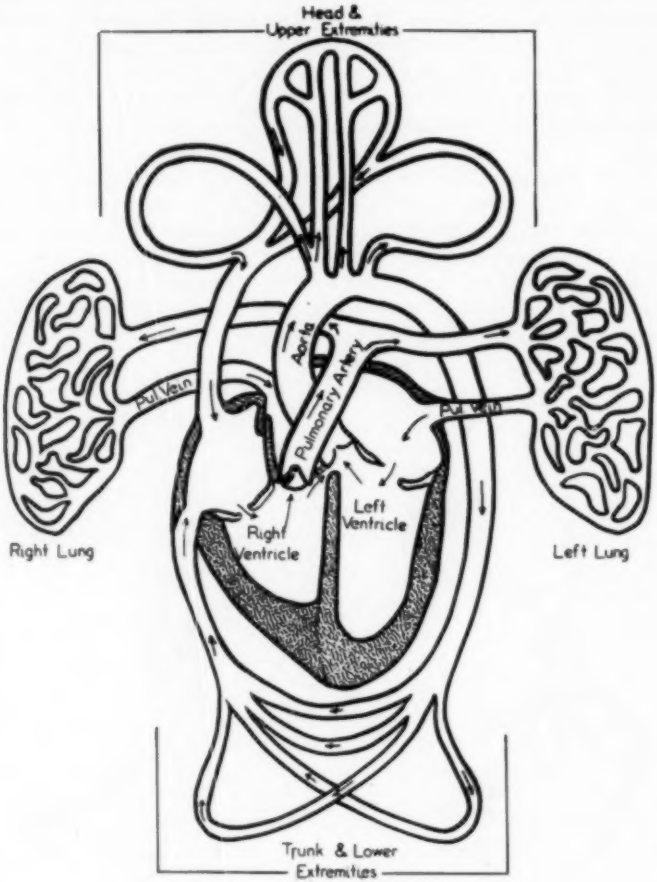
FIGURE 2a FIGURE 2b

FIGURE 2: Dilatation of the aortic valve.

Figure 2a: Retrograde through the carotid artery.
Figure 2b: Through the left ventricle.

cardiovascular defect to those already existing. Cases of hypoplastic right ventricle or of single ventricle with pulmonic stenosis can also be successfully treated in this manner (Figures 4 and 5a, b, c, d).

However, Brock[4] has shown that direct surgical relief of pulmonic stenosis is possible both in the "pure" type and in the tetralogy of Fallot. While it is now generally agreed that this



Tetralogy of Fallot

(Modified from Taussig)

FIGURE 3

approach is both feasible and physiologically logical in "pure" stenosis, many are reluctant to apply this principle in tetralogy. Certainly relief of the stenosis would have the effect of reducing the number of cardiovascular defects existing in that patient, rather than of increasing them as in the shunt (anastomosis) procedures. The argument that the stenosis is usually infundibular (in the outflow tract) rather than valvular (in the pulmonary valve) in tetralogy is not pertinent since infundibular stenosis, too, is amenable to direct surgical relief. Furthermore, our own experience as well as that of Brock and Keith[5a,5b] indicates that valvular stenosis is probably almost as common as the infundibular variety in these cases. In about 10 per cent of cases the stenosis is in the pulmonary artery itself.

The diagnosis of the exact type of stenosis can often be made prior to surgery by angiocardiography and cardiac catheterization, but can always be made at operation as soon as the pericardium is opened. The technique of relief of the stenosis varies with the type.

In the valvular type a special knife with an olivary tip and a diamond-shaped blade is passed through the wall of the right ventricle and then up into the pulmonary artery, dividing the fused valve cone into a bicuspid functioning pulmonary valve (Figure 6).

In the infundibular type the left little finger is inserted through a small incision into the right ventricle to palpate the exact level and type of the obstruction. With this knowledge a special punch of the Brock type, or a pair of rongeurs of the Glover type is thrust through the incision into the cardiac chamber to resect a portion of the obstruction (Figures 7a, b, c).

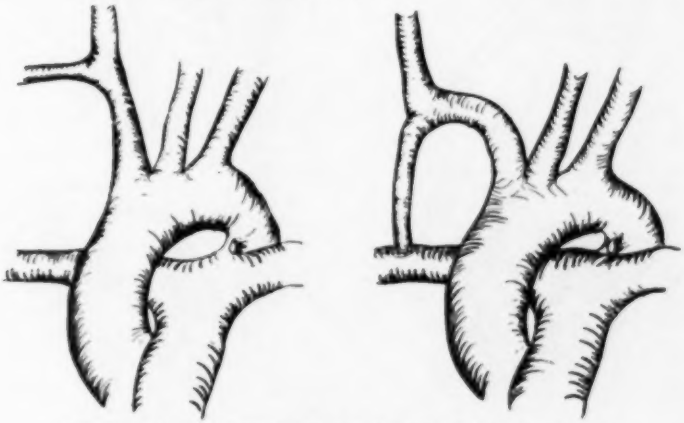


FIGURE 4: Blalock anastomosis (subclavian-pulmonary artery).

In limited stenosis of the pulmonary artery above the valve, dilatation by graduated sounds of the urethral type, again passed through the artery via the right ventricle, permits enlargment of the lumen to an adequate size. In cases of extreme hypoplasia of the artery the direct approach is inapplicable and a shunt operation is indicated (Figures 8a, b, c, d).

To date we have operated upon 19 cases of tetralogy of Fallot by the direct approach. There were four deaths. In 10 the stenosis was valvular, in six infundibular, and in three there was an actual limited arterial stenosis. The post-operative arterial oxygen saturation in all the living cases who have been so studied is well over 90 per cent. This is in contrast to the 70 to 80 per cent usually obtained by a shunt.

These individuals, at least to a degree, have a lessening of the number of their defects. They have no artificial patent ductus arteriosus to become a site for subacute bacterial infection and to constantly overwork the heart.

Mitral Valve

Mitral disease is the commonest of the clinically important valvular involvements. Probably 50 per cent of the cases present

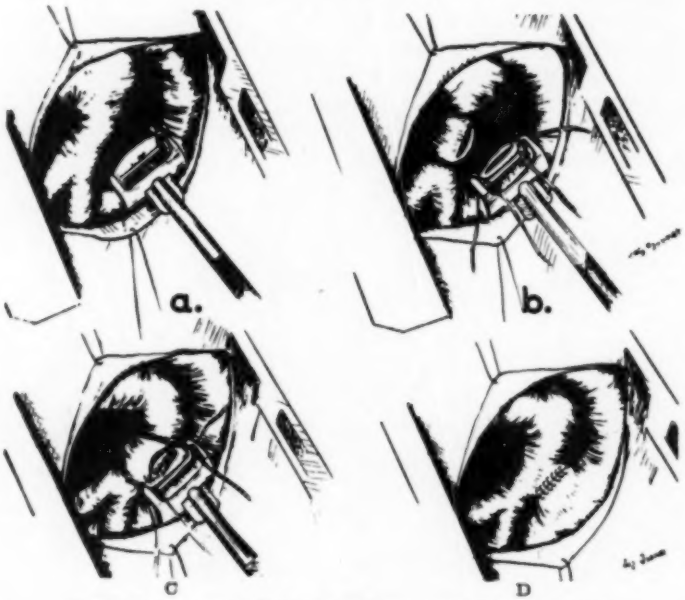


FIGURE 5a, b, c, d: Potts aorta—pulmonary artery anastomosis.

a pure mitral stenosis with no insufficiency. The other 50 per cent are insufficient, varying from slight to complete. In some cases the valvular structure feels normal, but shortening of the chorda tendineae keeps the valve from closing, producing a valvular dysfunction.

Essentially the mitral valve is very similar to the human mouth. It consists of two lips which approximate in the form of a slit. Upon wide opening it presents a rounded orifice. Stenosis of the mitral valve, nearly always due to rheumatic infection, produces a thickening, stiffening, and shrinking of the valve structure in the zone of valve contact or approximation. The valve becomes fixed or frozen in the position of partial closure. Thus the slit-like opening is produced which has been likened to a buttonhole or a fish mouth. Microstoma of the human mouth too, whether due to infection or to chemical or thermal burns, produces a narrow, rigid slit of the vermilion border of the mouth. Away

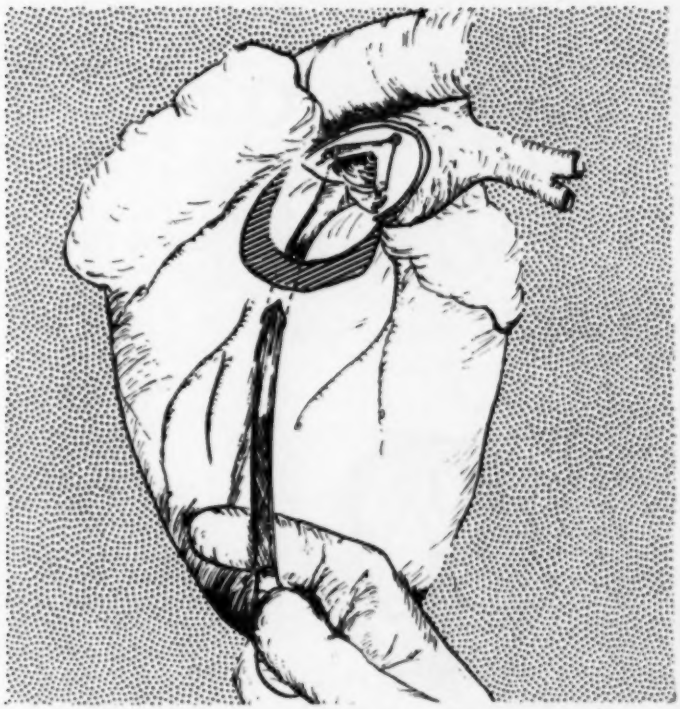


FIGURE 6: Division of valvular type of pulmonary stenosis.

FIGURE 7a

FIGURE 7b

FIGURE 7c

Figure 7a: Exploration of right ventricle with little finger.
Figure 7b: Use of Brock Punch to enlarge subvalvular stenotic orifice.
Figure 7c: Use of Glover rongeur to resect infundibular stenosis.

from the narrowed orifice the tissues become progressively less diseased, so that the basal portion of the valve cone or the circumoral soft tissues may be completely normal and flexible.

In either condition the stenosis may be relieved without producing regurgitation by a procedure known as commissurotomy. The extremities or commissures of the valve or oral slit respectively are incised well beyond the encircling scar tissue and out into the thin, flexible normal peripheral tissue. The result is a great enlargement of the orifice with restoration of much mobility and function to the organ[6-11] (Figures 9a, b).

To date we have performed 97 commissurotomies for mitral stenosis. In 1948 five such cases were operated, with three deaths. In 1949 there were 21 operated, with three deaths. In 1950 so far, 71 have been operated with four deaths. Our living patients have shown varying degrees of improvement, from complete restoration of clinical health to no obvious change. In each instance the amount of improvement has been directly related to the pathology present and to the amount of valvular function which the operator has been able to restore. Thus thin, flexible valve cones, purse-stringed at the apex, permit a nearly complete restoration to normality. Heavily calcified, terribly distorted valves permit little restoration of valve function. The bold, experienced operator frequently is able, however, to produce a large valvular opening even after a beginner (such as one of our residents) has failed

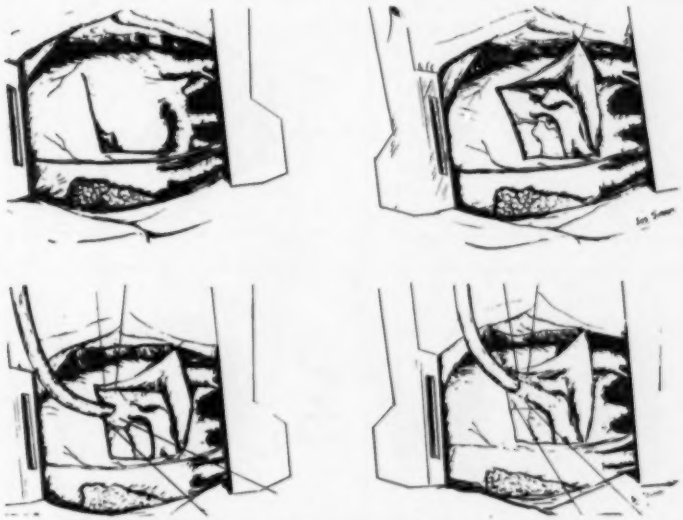


FIGURE 8: Steps illustrated for dilating limited pulmonary artery stenosis.

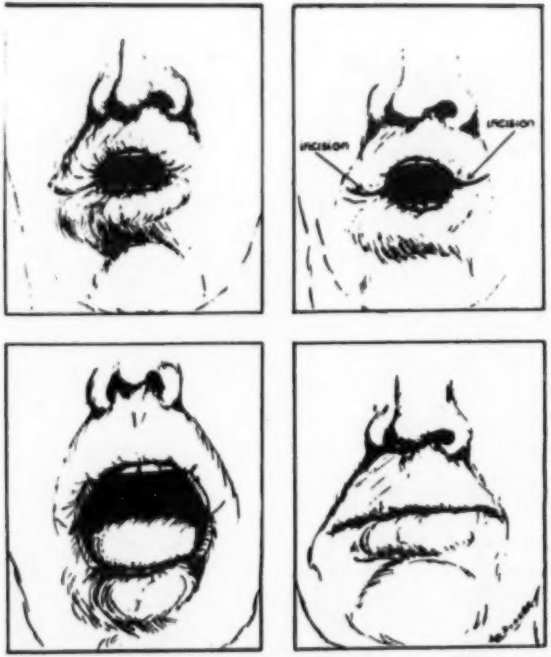


FIGURE 9a: Top left, Microstoma; top right, Commissurotomy for Microstoma; bottom left, Maximum resultant aperture, postoperatively; bottom right, closure permitted postoperatively.

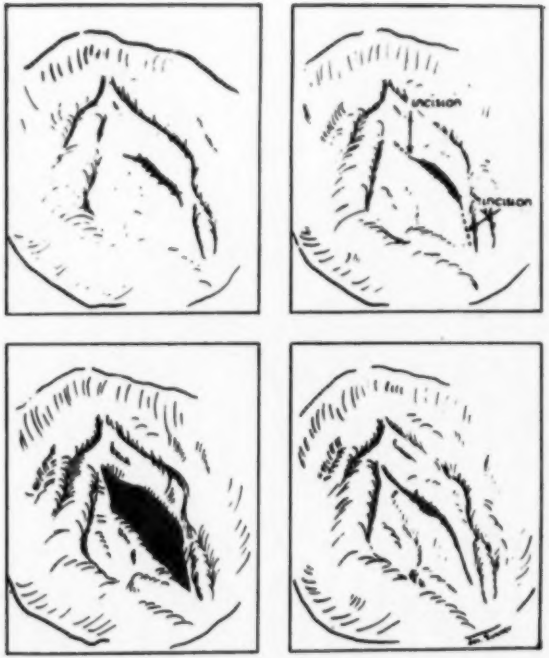


FIGURE 9b: Top left, Mitral stenosis; top right, Bilateral Commissurotomy; bottom left, opening of valve orifice on ventricular diastole; bottom right, closure of orifice on ventricular systole.

to accomplish any worthwhile enlargement of the orifice. Some of our five or six clinically inadequate results are undoubtedly due to such inexperience, even in the hands of the attending surgeons. An increase in the amount of pre-existing regurgitation may also be produced, particularly if the valvular incision is not well directed. This regurgitation can be fatal if excessive, but an experienced surgeon by opening the valve a little at a time, and by feeling the regurgitant rush of the blood stream through the

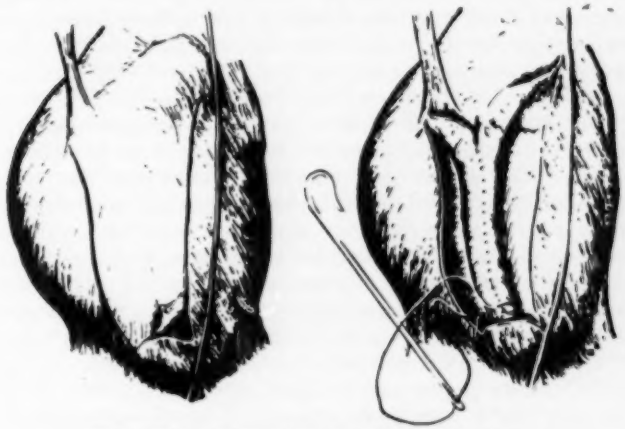


FIGURE 10a: Preparation of pedicle graft to form a tube of the anterior pericardium.

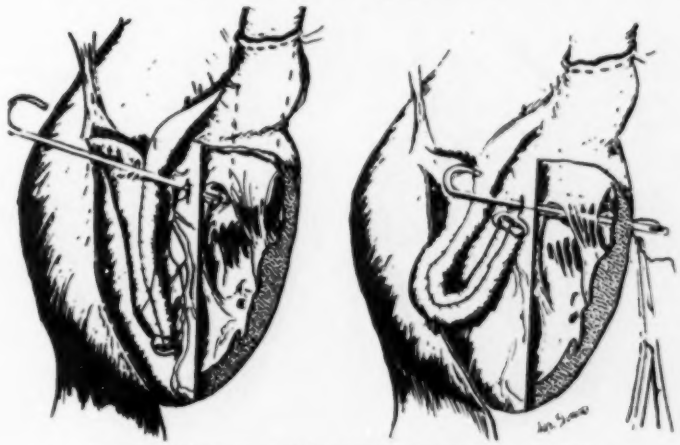


FIGURE 10b: Passage of threaded probe transventricularly just inferior to mitral orifice.

valve with each systole, will be able to terminate the procedure before a serious insufficiency is produced. Ideally there should be no more regurgitation at the end of the procedure than that appreciated (by palpating the regurgitant stream within the heart) at the beginning of the procedure. This desired end is usually accomplished, and indeed often to the degree that no regurgitation at all exists at the end of the procedure.

In most cases it will be felt desirable to divide both valve commissures to permit sufficient opening of the orifice. However, in certain very flexible valves in which the orifice of the cone is closed apparently as by a drawstring, a single incision of the anterolateral commissure will be sufficient to completely relieve the obstruction. In other cases where a degree of valve dysfunction exists, even accurate conservative incision of one commissure may produce an unexpectedly large amount of increased regurgitation. Further section should be immediately terminated when this is appreciated, lest a lethal amount be produced. If the orifice still seems grossly too small, however, some cautious attempt at incision of the opposite commissure may be undertaken, with the intention of stopping at any sign of further increase of the valve leakage. It must be remembered that some of these cases may have presented clinical insufficiency early in the course of their disease before the constricting or stenosing tendency of their pathology gradually replaced the insufficiency by clinical stenosis. Such valves presumably may again show an unusual tendency toward the restoration of regurgitation if the constricting ring is divided even at the commissures. The surgeon is then confronted with

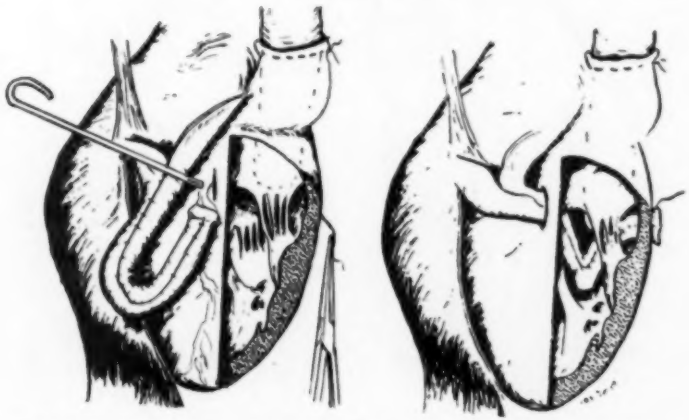


FIGURE 10c: Withdrawal of probe while leaving suture with subsequent placement of graft by traction on the suture.

the decision: Shall we accept a partial but inadequate relief of stenosis, or shall we persist in relieving the stenosis adequately even at the price of a serious degree of insufficiency? The latter may be just as incapacitating a mechanical handicap as the other, and indeed may even be promptly lethal if sufficient in amount.

Until recently our decision would have been on the side of caution, even at the price of an inadequate relief of the stenosis. However, having been troubled by this problem of surgical production of mitral regurgitation, by those cases in which preexisting regurgitation was a prominent part of the rheumatic process, and particularly by those cases presenting apparently "pure" regurgitation, we have perfected a method of applying a pedicled graft of pericardium through the left ventricle just to the ventricular side of the mitral orifice. This has been described in another article[12] under the name of *Transventricular Pericardial Tamponge.*

The technique is simple: After preparing a broad-based pericardial graft in which the blood and nerve supply is preserved, the right index finger is inserted through the left auricular appendage and through the widely open mitral valve (either wide naturally or after adequate incision of any coexisting stenosis). A threaded probe is then passed through the left ventricle as previously described, guided and controlled by the finger within the heart. When it emerges from the lateral and posterior aspect of the ventricle, the suture is grasped and the probe is withdrawn. There is only slight bleeding up to this point. The sutures have

FIGURE 11a

FIGURE 11b

Figure 11a: Position of graft on ventricular diastole.
Figure 11b: Position of graft on ventricular systole.

previously been attached to the free end of the graft, and it is now drawn completely through the heart to lie just to the ventricular side of the mitral orifice. It occludes the myocardial openings as it is passed so that bleeding is negligible. The graft is sutured to the epicardium at the points of entrance and exit, taking care that it is adequately loose to swing freely within the heart chamber (Figures 10a, b, c). On auricular systole the graft floats away from the mitral orifice but on ventricular systole it is blown into the opening, completely blocking further regurgitation. All this can be fully appreciated by the palpating intracardiac finger so that the completness of correction of the mitral regurgitation, pre-existing or produced, can be accurately estimated (Figures 11a and 11b).

SUMMARY

We have presented reasonably adequate methods of surgical correction of congenital pulmonary stenosis and of mitral stenosis, either acquired or congenital. Congenital tricuspid atresia or stenosis is best handled by treating the associated pulmonary stenosis. Aortic stenosis can be partially helped or palliated by simple limited mechanical dilatation. Better methods of control of aortic stenosis may, however, soon be available.

Unfortunately, we are not yet able to do anything for regurgitant disease of the heart valves with the single exception of regurgitant mitral lesions. Transventricular pericardial tamponage is a highly effective and promising method of controlling mitral insufficiency, either pre-existing or acquired. It may also be employed as an emergency corrective type of treatment if the operator, during commisurotomy for mitral stenosis, inadvertently cuts or tears the mitral ring across one of the cusps, producing an insufficiency sure to prove fatal.

It must nevertheless be remembered that the surgery of valvular heart disease is still in its very infancy.

RESUMEN

Se han presentado métodos adecuados y razonables de corrección quirúrgica de la estenosis congénita pulmonar y de la estenosis mitral ya sea adquirida o congénita. La atresia tricúspide congénita o la estenosis es mejor atendida tratando la estenosis pulmonar asociada. La estenosis aórtica puede ser mejorada parcialmente o paliada por simple dilatación mecánica. Sin embargo, pronto pueden esperarse mejores métodos de control de la estenosis aórtica.

Desgraciadamente aún no estamos capacitados para hacer algo

en el síndrome regurgitante de las válvulas del corazón con la sola excepción de las mitrales con ese carácter.

El taponamiento transventricular es un método muy efectivo y prometedor para controlar la insuficiencia mitral ya sea preexistente o adquirida.

Puede emplearse también como tratamiento de emergencia si el operador accidentalmente desgarra el anillo mitral a través de una cúspide, produciendo una insuficiencia que seguramente resulta fatal.

Sin embargo, debe recordarse que la cirugía valvular del corazón se encuentra realmente en su infancia.

RESUME

Les auteurs s'attachent à exposer les métodes capables de pallier chirurgicalement au rétrécissement pulmonaire congénital et au rétrécissement mitral, soit acquis, soit congénital. L'atrésie ou le rétrécissement congénital de la tricuspide est mieux jugulé par le traitement du rétrécissement pulmonaire associé. Le rétrécissement aortique peut être partiellement soulagé par une simple dilatation mécanique. De meilleurs moyens de traitement du rétrécissement aortique seront cependant bientôt possibles.

Malheureusement nous ne sommes pas capables actuellement d'agir sur les insuffisances valvulaires, à part l'insuffisance mitrale. Le tamponnement péricardique trans ventriculaire est une méthode très efficace et pleine de promesses. Elle s'adresse aussi bien à l'insuffisance mitrale acquise qu'à l'insuffisance mitrale congénitale. Elle peut être également utilisée comme technique d'urgence, si un opérateur, par lésion de l'anneau mitral produit accidentellement une insuffisance au cours de l'intervention.

Il ne faut toutefois pas oublier que la chirurgie des cardiopathies valvulaires est encore à son extrême début.

REFERENCES

1 Bailey, C. P., Glover, R. P., O'Neill, T. J. E. and Ramirez, H. P. R.: "Experiences with the Experimental Surgical Relief of Aortic Stenosis," *J. Thor. Surg.*, 20:516, 1950.

2 Blalock, Alfred and Taussig, Helen: "Surgical Treatment of Malformations of the Heart in which there is Pulmonary Stenosis of Pulmonary Atresia," *J.A.M.A.*, 128:189, 1945.

3 Potts, Willis, Smith, Sidney and Gibson, Stanley: "Anastomosis of Aorta to Pulmonary Artery: Certain Types in Congenital Heart," *J.A.M.A.*, 132:627, 1946.

4 Brock, R. C.: "The Surgery of Pulmonary Stenosis," *Brit. M. J.*, 2: 399, 1949.

5 a. Keith, Arthur: "The Hunterian Lectures on Malformations of the Heart," delivered before the Royal College of Surgeons of England. LectureI, delivered on March 8, 1909, *Lancet*, 2:359, 1909.

5 b. Keith, Arthur: "The Hunterian Lectures on Malformations of the

Heart," delivered before the Royal College of Surgeons of England. Lecture III, delivered on March 12, 1909, *Lancet*, 2:519, 1909.

6 Bailey, C. P.: "The Surgical Treatment of Mitral Stenosis (Mitral Commissurotomy)," *Dis. of Chest*, 15:377, 1949.

7 Bailey, C. P., Glover, R. P. and O'Neill, T. J. E.: "The Surgery of Mitral Stenosis," *J. Thoracic Surg.*, 19:16, 1950.

8 Glover, R. P., O'Neill, T. J. E. and Bailey, C. P.: "Commissurotomy for Mitral Stenosis," *Circulation*, 1:329, 1950.

9 O'Neill, T. J. E., Glover, R. P. and Bailey, C. P.: "Commissurotomy for Mitral Stenosis," *J. International College of Surgeons*, 13:355, 1950.

10 Bailey, C. P., Glover, R. P. and O'Neill, T. J. E.: "Mitral Stenosis—Its Surgical Treatment by Commissurotomy," *Penna. Med. J.*, 53:375, 1950.

11 Glover, R. P., Bailey, C. P. and O'Neill, T. J. E.: "Surgery of Stenotic Valvular Disease of the Heart," *J.A.M.A.*, 144:1049, 1950.

12 Bailey, Charles P., O'Neill, Thomas J. E., Glover, Robert P., Jamison, William L. and Ramirez, Hector P. Redondo: "Surgical Repair of Mitral Insufficiency (A Preliminary Report) 'Transventricular Pericardial Tamponage,'" *Dis. of Chest*, 19:125, 1951.

The Influence of Cortisone on Experimental Tuberculosis of Guinea Pigs

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The marked effects of cortisone on a disease such as rheumatoid arthritis,[1] in which bacterial hypersensitivity is said to play a part, suggested to us that perhaps cortisone would alter the pathogenesis of tuberculosis, a disease in which bacterial hypersensitivity occurs as a prominent feature. The following report is an account of an experiment in which it was found that the administration of cortisone to tuberculous guinea pigs was not beneficial and may even have been harmful. Furthermore, the use of this hormone appeared to inhibit the beneficial effects of a low dose of streptomycin. It was also found that tuberculin hypersensitivity was diminished by the administration of cortisone.

Methods

Forty-eight mature male guinea pigs ranging in weight from 750 to 800 gm. were each inoculated subcutaneously over the sternum with 0.1 mg. of virulent human-type tubercle bacilli (H37Rv.). On the 18th day of infection the animals were each injected intradermally on the left side of the belly wall with 0.1 ml. of 1:100 Old Tuberculin which resulted in a positive reaction in each animal when examined 48 hours later. On the 20th day of infection six animals (pretreatment controls) were killed and were found to have grossly visible lesions of tuberculosis in the liver and spleen, the site of inoculation and the axillary lymph nodes as shown in figure 1. Although only one of these animals had grossly apparent lesions in the lungs, subsequent histopathologic examination disclosed that all had small tuberculous foci in the pulmonary tissue. It is presumed that the remaining 42 animals had progressing tuberculosis comparable to that seen in the pretreatment controls.

On the 21st day of infection the remaining 42 animals were divided into five groups as shown in figure 1 consisting respectively of 10 untreated animals to serve as controls; eight animals

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to be treated once daily with 6 mg. of streptomycin; eight to be treated once daily with 2 mg. of streptomycin; eight to be treated once daily with 2 mg. of cortisone* and lastly, a group of eight animals to be treated once daily with 2 mg. of streptomycin plus 2 mg. of cortisone. In addition to the infected animals, there were also six normal guinea pigs treated once daily with 2 mg. of corti-

*The cortisone was furnished through the courtesy of Dr. J. M. Carlisle, Merck & Co., Inc., Rahway, New Jersey.

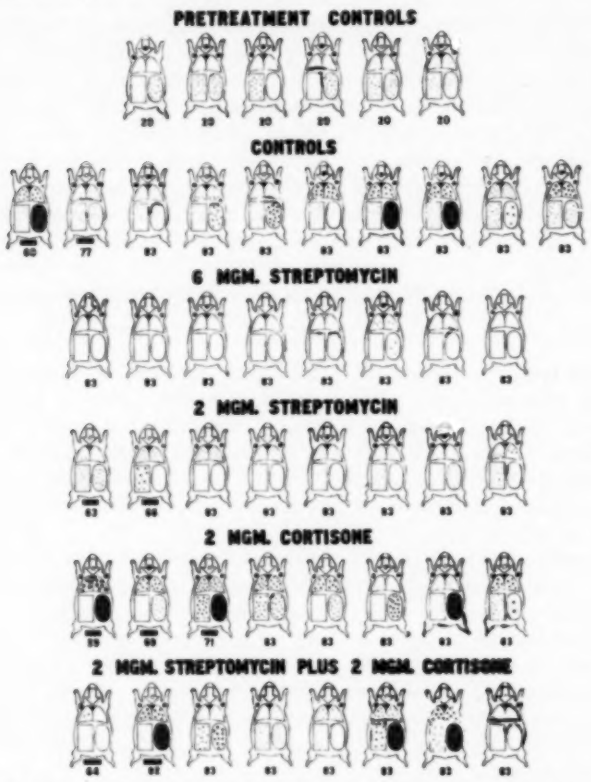

FIGURE 1: Schematic presentation of the extent of tuberculous lesions seen in each animal at necropsy. The rectangle and oval represent liver and spleen respectively. The dot or circle in the arrow indicates an abscess or an ulcer. Miliary and nodular lesions in the organs are represented by dots. Complete blackening of the spleen indicates diffuse tuberculous involvement. The numerals indicate the number of days of infection, and the black bar means that the animal died before the end of the experiment. The amount of drug shown was given to each animal once daily starting on the 21st day of infection. Treatment was continued for 62 days.

sone and six normal guinea pigs treated once daily with 2 mg. of cortisone plus 2 mg. of streptomycin. These animals were included for weight controls. The materials were injected into the axillary space in 1 ml. of solution. Treatment started on the 21st day of infection and continued for 62 days, at which time the surviving animals were killed.

The doses of streptomycin were based on experience which showed that the administration of 2 mg. of streptomycin daily for approximately eight weeks would result in only a partial but measurable therapeutic effect in tuberculous guinea pigs, whereas the administration of 6 mg. daily causes almost complete regression and healing of the disease. As previously pointed out, when one is studying the effects of other agents used in combination with streptomycin, it is necessary that streptomycin be used in subeffective doses in order to enable one to detect any additive effect.[2] The daily dose of cortisone, 2 mg. per animal, was arbitrarily selected on the basis of the total amount available for the experiment. During the treatment period all the animals, including the controls, were weighed once weekly. Tuberculin tests were done using 0.1 ml. of 1:100 Old Tuberculin on the 15th day of treatment, 0.1 ml. of 1:1,000 Old Tuberculin on the 35th day of treatment and a third test at the end of the treatment period using 0.1 ml. of 1:10,000 Old Tuberculin. The tuberculin was injected intradermally on the left belly wall 48 hours prior to recording the results. The lower concentrations of tuberculin were used in the last two tests because of the work of Sarber[3] who found that the inhibitory effects of benadryl on tuberculin reactions in guinea pigs were more pronounced using 1:1,000 Old Tuberculin than when a dilution of 1:100 was used. It was felt that if cortisone had any inhibiting effect on the tuberculin reaction it would possibly be more easily detected using low concentrations of tuberculin. As described later, this eventually proved to be the case.

After 62 days of treatment all the surviving animals, including the controls, were killed. A record was made at necropsy of the extent of disease in each animal as presented schematically in figure 1. Portions of lung, liver, spleen, site of inoculation, axillary lymph nodes and tracheobronchial lymph nodes were selected for histopathologic study.

Results

Weight Change: During the course of the experiment it became evident that the administration of cortisone or cortisone plus streptomycin to the tuberculous guinea pigs was harmful or at least not beneficial as indicated by their failure to gain weight in comparison to each other group of animals including the in-

fected control animals. Referring to figure 2 it is seen that the normal animals given cortisone alone or in combination with streptomycin gained weight rapidly, which was in marked contrast to the tuberculous animals similarly treated. Beginning with the fourth week of treatment the infected animals given cortisone alone or with streptomycin had an average loss of weight, whereas each of the other groups, including the infected controls, showed some gain of weight by the end of the experiment.

Tuberculin Tests: The tuberculin tests done with 0.1 ml. of 1:100 Old Tuberculin and read 48 hours later on the 15th day of treatment revealed no significant differences between the various groups of animals regarding the size of the area of erythema and the number of animals with necrosis of the reaction. However, a second test which was done on the 35th day of treatment using 0.1 ml. of 1:1,000 Old Tuberculin did indicate that the administration of cortisone reduced the size of the reaction and the number of reactions with necrosis. A third tuberculin test was applied on the 60th day of treatment using 0.1 ml. of 1:10,000 Old Tuberculin. When examined 48 hours later there was a strik-

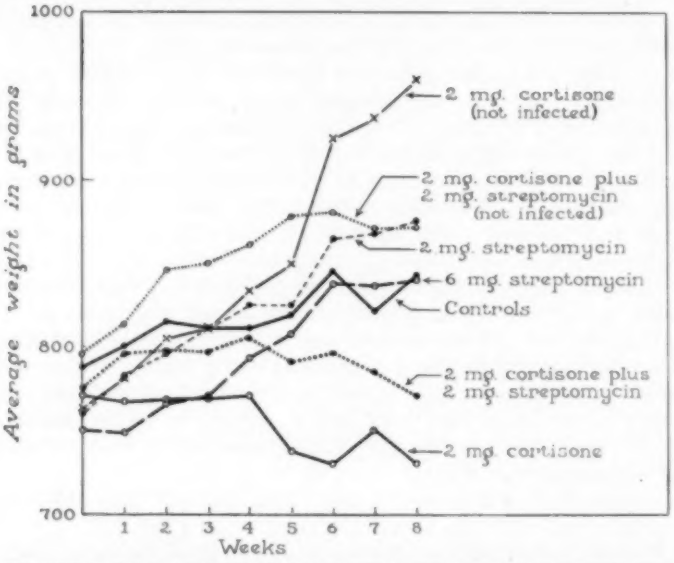

FIGURE 2: Average weights of the animals in each group. The animals were weighed once weekly beginning on the 21st day of infection, which was the first day of treatment. It will be seen that the tuberculous animals given cortisone alone or in combination with streptomycin failed to gain weight, which is in marked contrast to the other groups, including the untreated controls.

ing difference between the group that received cortisone and those that did not, as shown in table I.

Deaths of Animals: Only a few animals died before the end of the experiment, as indicated in figure 1. The control animal that died on the 60th day of infection had sufficient tuberculous disease to account for death, but for the animal that died on the 77th day the cause of death is not known. The gross and especially the microscopic appearance of the lesions was not severe enough to be incompatible with life. This was also true of the two animals treated with 2 mg. of streptomycin daily that died on the 63rd and 66th day of infection respectively. However, each of the three animals in the group treated with cortisone that did not survive did have sufficiently extensive tuberculous involvement of the parenchymal organs to account for their death. Microscopic examination disclosed disseminated involvement especially of the pulmonary tissue. In the animal in this group that died on the 69th day of infection there were innumerable microscopically evident tuberculous foci in the liver which were not observed at necropsy. In the group treated with cortisone plus streptomycin the first animal to die succumbed on the 64th day of infection. It was found to have very little gross or microscopic evidence of active tuberculous disease, suggesting that perhaps the administration of cortisone had augmented the beneficial effects of the low dose of streptomycin. This impression, however, was neutralized by the finding of extensive involvement especially of the spleen and lungs of the animal that died on the 82nd day, which was one day preceding termination of the experiment. Microscopic examination disclosed unrestricted progression of the lesions in all the parenchymal organs with no evidence that the animal had been given streptomycin in addition to cortisone.

Necropsy Observations: Figure 1 presents schematically the extent of the grossly visible tuberculous lesions seen when the

TABLE I

REACTIONS TO 0.1 Ml. OF 1:10,000 OLD TUBERCULIN INJECTED ON THE SIXTIETH DAY OF TREATMENT AND READ FORTY-EIGHT HOURS LATER

Group	Animals	Diameter of Area of Erythema		Number with Necrosis
		Mean, mm.	Range, mm.	
Controls	8	10.2	7-16	4
2 mg. streptomycin	6	12.5	10-16	3
2 mg. cortisone	5	5.4	0-10	None
2 mg streptomycin plus 2 mg. cortisone	7	7.0	0-11	None

animals were killed at the end of the experiment. In comparison to the amount of disease seen in the controls it is apparent that the administration of 6 mg. of streptomycin once daily for 62 days caused a marked reversal of the progressive disease that is presumed to have been present when treatment started. There were, however, residual foci at the site of inoculation in a few animals and also in the axillary lymph nodes. The administration of 2 mg. of streptomycin resulted in only partial inhibition of the disease, although two animals had no grossly apparent lesions in the lungs, liver or spleen. The extent of the lesions seen at necropsy in the animals given cortisone is comparable to that seen in the untreated control animals; and, with two exceptions, this is true also of those treated with streptomycin plus cortisone. It appeared that in six of the eight animals in this group the beneficial effect of treatment with 2 mg. of streptomycin daily was not seen when 2 mg. of cortisone was given concomitantly.

Histopathologic Examination: Microscopic study of tissues from the pretreatment controls provided evidence that an actively progressive disease had been established by the 20th day of infection. As noted previously, there were tuberculous foci in the pulmonary tissue of those animals whose lungs appeared grossly normal at necropsy. The parenchymal organs, the site of inoculation and the axillary nodes of the untreated controls presented the picture of conglomerate destructive lesions typical of inoculation tuberculosis in guinea pigs. Figure 3a is that of a section of lung from a control animal showing the unrestricted morbid process replacing the pulmonary tissue. The microscopic appearance of the lesions in the animals given 2 mg. of cortisone daily (fig. 3b) was similar to that seen in the untreated animals. While the histologic preparations were being studied the impression was obtained that the disease in the animals given cortisone alone was progressing more rapidly and was more extensive than in the control animals. This was difficult to evaluate, however.

Treatment with 6 mg. of streptomycin once daily appeared to have effected regression and healing of lesions which may be presumed to have been active when treatment started. There were no microscopically evident lesions of active tuberculosis in the lungs or spleens of these animals. Only one animal had residual lesions in the liver, most of which were becoming fibrotic. However, the axillary lymph nodes in all these animals retained areas of necrosis.

The administration of 2 mg. of streptomycin daily resulted in a definite retardation of the disease, but in contrast to the animals treated with 6 mg. of streptomycin daily there were still some recognizable tubercles in the parenchymal organs in all but two

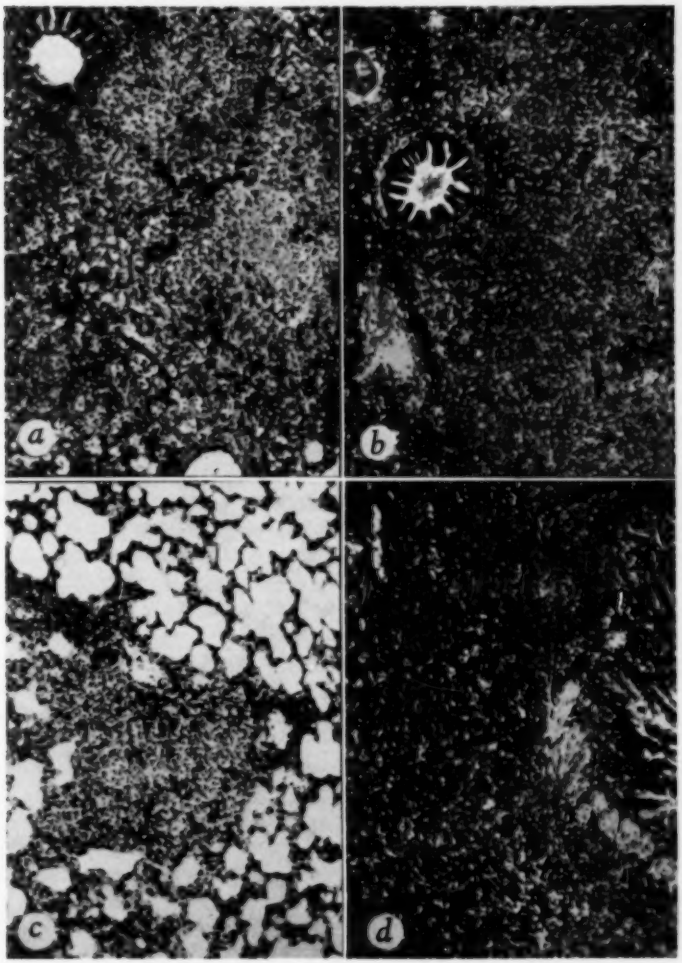

FIGURE 3: (a) Lung of control animal killed 83 days after infection.—(b) Lung of animal treated with 2 mg. of cortisone daily for 62 days starting on the 21st day of infection.—(c) Lung of animal treated daily with 2 mg. of streptomycin for 62 days starting on the 21st day of infection.—(d) Lung of animal treated daily with 2 mg. of cortisone plus 2 mg. of streptomycin for 62 days starting 21 days after infection. The disseminating morbid process shown in (d) is similar to that shown in (a) and (b) and is in marked contrast to the restriction of the disease shown in (c).

of the eight animals. Figure 3c presents a typical pulmonary lesion in an animal treated with only 2 mg. of streptomycin.

Of particular interest were the histologic findings in the animals treated daily with 2 mg. of streptomycin plus 2 mg. of cortisone With the exception of two animals, the lesions were comparable in extent and appearance to those seen in the controls and in those given cortisone alone. There were none of the microscopic features of healing such as the fibrosis seen in those given 2 mg. of streptomycin alone. Figure 3d is that of a lung from an animal given cortisone plus streptomycin. The two exceptions noted earlier in this paragraph were the animals that at necropsy were found to have little macroscopic evidence of tuberculosis. Histopathologic study of tissues from these two animals revealed that unlike the others in the group, they did have a beneficial response to the administration of streptomycin. Sections of the lungs and liver revealed no active lesions. One had a few active tuberculous foci in the spleen.

An index of infection based on the character of the lesions and the extent of involvement was determined for each group of animals in the experiment. By this method, values of 10 to 35 are given to the parenchymal organs with actively progressing tuberculous lesions, depending on the degree of involvement. For inac-

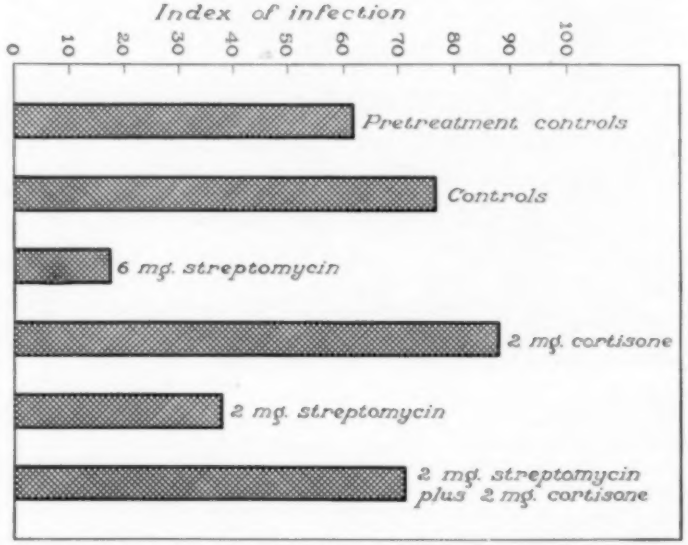

FIGURE 4: Average index of infection for each group based on histopathologic characteristics. The procedure is described in the text.

tive lesions with evidences of healing such as fibrosis and calcification values of one to three are given.[4] A comparison of the average index for each group may be made by referring to figure 4. In comparison to the untreated controls and those given cortisone alone, the lower index obtained for the group treated with 2 mg. of streptomycin plus 2 mg. of cortisone is due to the two animals in this group that, unlike the others, did have histologic evidence of healing and regression of the disease presumably due to the administration of 2 mg. of streptomycin. If these two were excluded, the index of infection for the group given cortisone plus streptomycin would be the same as that obtained for the animals given cortisone alone.

These results made it desirable to determine the effect of cortisone on streptomycin in vitro. Two series of twofold dilutions of streptomycin ranging from 2.0 to 0.03 microgram per milliliter were made in Proskauer and Beck liquid medium and distributed in 2 ml. amounts into test tubes. One series was made to contain 0.2 mg. of cortisone per milliliter of medium in addition to the streptomycin. Each tube of medium was inoculated with 0.1 mg. of tubercle bacilli from the same strain used in the animal experiment. After 10 days of incubation and again after 18 days of incubation it was found that in both series growth was inhibited by a concentration of 0.25 microgram of streptomycin per milliliter. There was no evidence that the presence of cortisone interfered with or enhanced the bacteriostatic effect of streptomycin. The tests were repeated using the liquid medium with 10 per cent horse serum, which gave the same results.

Comment

The mechanisms of resistance to tuberculosis and the factors which permit healing of a tuberculous lesion are not known. It is possible that they are not the same in all species. In the experiment described here the histologic evidence suggests that the administration of cortisone prevented restriction of the disease by inhibiting fibrosis. Spain and Molomut[5] conducted a similar experiment in guinea pigs and found that in animals given cortisone plus streptomycin the lesions were more extensive and had much less granulation tissue than did those animals given streptomycin. For mice, however, Hart and Rees[6] concluded that the enhancement of the tuberculous process associated with the administration of cortisone could not be explained on the basis of depression of collagen formation. Solotorovsky and associates[7] reported that in mice the protective effect of vaccination with heat-killed tubercle bacilli was abolished by cortisone owing to interference with the immune response. Michael, Cummings and Bloom[8] found that the

natural resistance of rats to tuberculosis was markedly reduced by the administration of cortisone owing possibly to depression of the inflammatory response. Lurie and associates[9] found that in highly susceptible rabbits the administration of cortisone resulted in a greater number of tubercles being formed in the lungs but that the lesions were smaller than in the untreated animals. Furthermore, the spread of the disease to the tracheobronchial lymph nodes and to other organs from the lung was markedly reduced in infected rabbits given cortisone. Lurie and his associates[9] concluded that cortisone was able to transform a rabbit of high susceptibility to one that had some of the pathologic responses characteristic of the naturally resistant rabbit.

The clinical significance of the experimental work is not clear. In a preliminary note[10] regarding the experiment described in this report it was stated that in cases of tuberculosis cortisone should be investigated with caution, and on the basis of experiments on animals others have sounded the same warning.[5,6,8,11] Reports on the effects of ACTH or cortisone on clinical tuberculosis[12,13] are few and inconclusive concerning the danger of administering these hormones to patients with tuberculosis. It is the general experience, however, that cortisone or ACTH rapidly produces amelioration of symptoms and marked subjective improvement. Withdrawal of these agents is soon followed by a return of the signs of illness, which in some cases have been worse than before treatment was started. However, of particular interest are the reports of Browne[14] and Thorn[15] who described patients with Addison's disease and tuberculosis whose tuberculous disease responded favorably to treatment with streptomycin while the patients were being given cortisone also. Cummings[16] has found that the administration of cortisone to infected rats being treated with streptomycin does not interfere with the protective effect of the antibiotic agent. Although this finding is at variance with results obtained in guinea pigs reported in this paper and by Spain and Molomut[5] and Bogen and associates,[13] it does indicate that there are important species differences which must be considered when relating experiments on animals to clinical practice.

SUMMARY

Forty-eight guinea pigs were inoculated with virulent tubercle bacilli and 20 days later six were killed and found to have visible lesions of tuberculosis. The remaining animals were divided into groups as follows: 10 controls, eight treated once daily with 6 mg. of streptomycin, eight treated once daily with 2 mg. of streptomycin, eight treated once daily with 2 mg. of cortisone, and eight treated once daily with 2 mg. of streptomycin plus 2 mg. of cor-

tisone. Treatment started on the 21st day of infection and continued for 62 days. During the course of treatment the animals given cortisone alone or in combination with streptomycin showed an average loss of weight and also a decrease of sensitivity to tuberculin in comparison to the other groups. After 62 days of treatment all animals were killed. The untreated controls and those given cortisone alone were found to have extensive tuberculous disease in the lungs, liver and spleen. There was almost complete absence of visible lesions in those given 6 mg. of streptomycin. Those given 2 mg. of streptomycin had less disease than seen in the controls. Only two of eight animals given streptomycin plus cortisone appeared to have responded beneficially. The other six had visible lesions of tuberculosis comparable to those seen in the controls. Histopathologic studies confirmed the necropsy findings. In six of the eight animals treated concomitantly with streptomycin and cortisone, the administration of cortisone appeared to have prevented the restriction and healing of the tuberculous process. Cortisone had no inhibitory effect on streptomycin in vitro.

RESUMEN

Se inocularon cuarenta y ocho cuyes con bacilos tuberculosos virulentos, y 20 días más tarde, se sacrificaron 6 de ellos, habiéndoles encontrado lesiones visibles de tuberculosis. Los animales restantes quedaron distribuídos en grupos, en la forma siguiente: 10 testigos; ocho recibieron tratamiento consistente en 6 mg. de estreptomicina una vez al día; ocho recibieron 2 mg. de estreptomicina una vez al día; ocho recibieron tratamiento de 2 mg. de cortisona, una vez al día, y ocho recibieron tratamiento, una vez al día, consistente en 2 mg. de estreptomicina y 2 mg. de cortisona. Se inició el tratamiento el día vigésimo-primero de la infección y se continuó durante 62 días. En el curso del tratamiento, aquéllos animales a quienes les fué administrada la cortisona sola o combinada con estreptomicina, acusaron una pérdida de peso en promedio, así como una disminución de sensibilidad a la tuberculina, en relación a los demás grupos. Pasados los 62 días, todos los animales fueron muertos. Los testigos, que no recibieron tratamiento alguno, y los cuyes a los que se les administró la cortisona sola, indicaron una tuberculosis extensa en los pulmones, el hígado y el bazo. En aquéllos que fueron tratados con 6 mg. de estreptomicina, se pudo apreciar una carencia casi absoluta de lesiones visibles. Los que recibieron una dósis de 2 mg. de estreptomicina acusaban la enfermedad en grado menor que el observado en los testigos. De los animales a quienes se les administró la estreptomicina en combinación con la cortisona, sólo dos respondieron

benéficamente. Los seis restantes tenian lesiones visibles de tuberculosis, comparable a las vistas en los testigos. Los estudios histopatológicos confirmaron los resultados de las autopsias. En seis de los ocho cuyes tratados simultáneamente con estreptomicina y cortisona, la suministración de la cortisona parece haber evitado la restricción y curación del proceso tuberculoso. La cortisona no tuvo ningún efecto inhibitorio sobre la estreptomicina in vitro.

RESUME

Les auteurs ont inoculé 48 cobayes avec un bacille de KOCH virulent. Vingt jours après, six d'netre eux furent sacrifiés et se montrèrent porteurs de lésions tuberculeuses apparentes. Le restant des animaux fut divisé en plusieurs lots: 10 comme témoins, 8 traités une fois par jour par 2 mmg. de streptomycine, 8 traités une fois par jour par 2 mmg. de cortisone, et 8 traités une fois par jour par l'association de 2 mmg. de streptomycine et de 2 mmg. de cortisone. Le traitement débuta le 21éme jour après l'inoculation et fut continué pendant 62 jours. Au cours de ce traitement les animaux du groupe recevant de la cortisone isolément ou combinée à la streptomycine accusèrent une chute notable de poids et une diminution de leur sensibilité à la tuberculine par rapport aux animaux des autres lots. Tous les animaux furent sacrifiés après 62 jours de traitement. Les animaux témoins qui n'avaient reçu aucun traitement et ceux qui n'avaient reçu que de la cortisone présentaient une tuberculose étendue des poumons, du foie et de la rate. Il n'y avait à peu près aucune lésion visible chez ceux qui avaient reçu 6 mmg. de streptomycine. Ceux qui avaient été traités par 2 mmg. de streptomycine avaient moins de lésions que les témoins. Il n'y eut que deux des huit animaux traités par l'association de streptomycine et de cortisone que parurent en tirer avantage. Les six autres cobayes étaient atteints de lésions comparables à celle des témoins. Les examens histopathologiques confirmèrent les constatations faites à l'autopsie. Chez six des huit animaux traités simultanèment par la streptomycine et la cortisone, il semble que la cortisone a empêché l'arrêt du processus tuberculeux et sa guérison. La cortisone n'a pas d'action inhibitrice sur la streptomycine *in vitro*.

REFERENCES

1 Hench, P. S., Kendall, E. C., Slocumb, C. H. and Polley, H. F.: "The Effect of a Hormone of the Adrenal Cortex (17-hydroxy-11-dehydrocorticosterone: Compound E) and of Pituitary Adrenocorticotropic Hormone on Rheumatoid Arthritis. Preliminary Report," *Proc. Staff Meet., Mayo Clinic*, 24:181, 1949.

2 Karlson, A. G. and Feldman, W. H.: "The Subeffective Dose of Streptomycin in Experimental Tuberculosis of Guinea Pigs," *Am. Rev. Tuberc.*, 58:129, 1948.

3 Sarber, R. W.: "Effect of Benadryl Hydrochloride on the Tuberculin Reaction in Guinea Pigs," *Am. Rev. Tuberc.*, 57:504, 1948.
4 Feldman, W. H.: "A Scheme for Numerical Recording of Tuberculous Changes in Experimentally Infected Guinea Pigs," *Am. Rev. Tuberc.*, 48:248, 1943.
5 Spain, D. M. and Molomut, Norman: "Effects of Cortisone on the Development of Tuberculous Lesions in Guinea Pigs and on Their Modification by Streptomycin Therapy," *Am. Rev. Tuberc.*, 62:337, 1950.
6 Hart, P. D'A. and Rees, R. J. W.: "Enhancing Effect of Cortisone on Tuberculosis in the Mouse," *Lancet*, 2:391, 1950.
7 Solotorovsky, Morris, Gregory, F. J. and Stoerk, H. C.: "Loss of Protection by Vaccination Following Cortisone Treatment in Mice with Experimentally Induced Tuberculosis," *Proc. Soc. Exper. Biol. and Med.*, 76:286, 1951.
8 Michael, Max, Jr., Cummings, M. M. and Bloom, W. L.: "Course of Experimental Tuberculosis in the Albino Rat as Influenced by Cortisone," *Proc. Soc. Exper. Biol. and Med.*, 75:613, 1950.
9 Lurie, M. B., Zappasodi, Peter, Dannenberg, A. M., Jr. and Swartz, Irene B.: "Constitutional Factors in Resistance to Infection: The Effect of Cortisone on the Pathogenesis of Tuberculosis," *Science*, 113:234, 1951.
10 Karlson, A. G.: Quoted by Hench, P. S., Kendall, E. C., Slocumb, C. H. and Polley, H. F.: "Effects of Cortisone Acetate and Pituitary ACTH on Rheumatoid Arthritis, Rheumatic Fever and Certain Other Conditions," *Arch. Int. Med.*, 85:545, 1950.
11 "Cortisone and A.C.T.H. in Tuberculosis," (Leading article), *Lancet*, 2:632, 1950.
12 LeMaistre, C. A., Tompsett, Ralph, Muschenheim, Carl, Moore, J. A. and McDermott, Walsh: "Effects of Adrenocorticotrophic Hormone and Cortisone in Patients with Tuberculosis," *J. Clin. Investigation*, 30:445, 1951; in Mote, J. R.: Proceedings of the Second Clinical ACTH Conference, *The Blakiston Co.*, New York, 1951, vol. 2, pp. 363-368.
13 Bogen, Emil, Netzer, Solomon and Salkin, David: "Adreno-corticotropic and Adreno-cortico-genic Hormones in Tuberculosis," In Transactions of the 10th Conference on the Chemotherapy of Tuberculosis (Streptomycin Conference), Veterans Administration Area Office, Atlanta, Ga. and Central Office, Washington, D. C., 1951, pp. 251-258.
14 Browne, J. S. L.: "Discussion," In Mote, J. R.: Proceedings of the Second Clinical ACTH Conference, New York, *The Blakiston Co.*, 1951, vol. 2, p. 369.
15 Thorn, G. W.: "Discussion," In Mote, J. R.: Proceedings of the Second Clinical ACTH Conference, New York, *The Blakiston Co.*, 1951, vol. 2, p. 370.
16 Cummings, M. M.: "The Influence of Cortisone on Experimental Tuberculosis," Transactions of the 10th Conference on the Chemotherapy of Tuberculosis (Streptomycin Conference), Veterans Administration Area Office, Atlanta, Ga. and Central Office, Washington 25, D. C., 1951, pp. 247-251.

Reversible Forms of Heart Disease*

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For many years the diagnosis of heart disease connoted a life of invalidism with probable death by virtue of the affliction. In recent years, however, the marked advances in medical science have not only enabled the heart patient to live a more useful life but also have shown that many forms of heart disease are entirely curable. It is important to remember that a normal heart or one that is only slightly diseased may show symptoms that are solely the expression of some extracardiac disease, and that this extracardiac condition may manifest itself entirely or largely in the cardiovascular system. As a result, the cardiac symptoms may be so marked that they completely overshadow the underlying extracardiac disease. As a result the patient is often considered a cardiac invalid, whereas recognition of the effect of the extracardiac disease with treatment directed to the extracardiac condition usually brings about a reversibility in the cardiovascular symptoms. Failure on our part to recognize that many extracardiac diseases are expressed clinically through the cardiovascular system has led to unnecessary invalidism and even death. In every cardiac patient we must constantly be aware of the possibility that the heart itself may not be actually diseased but that rather it is acting secondarily to other conditions in the body. It is only by recognizing these extracardiac factors before they produce structural changes in the heart muscle that the treatment of the extracardiac disease may be instituted sufficiently early for the patient to be cured. It is the purpose of this paper to point out in a general way some conditions that are manifested entirely or largely through the cardiovascular system, with the result that a normal or a previously damaged heart may be precipitated into actual cardiac failure. It is apparent that all of the diseases that may produce such changes cannot be listed in the space permitted, and under these circumstances only a brief mention will be made of the various illnesses that can affect the cardiovascular system.

We are familiar with the symptoms presented by the markedly obese patient. He frequently complains of dyspnea, palpitation and precordial distress. Physical examination may often reveal an

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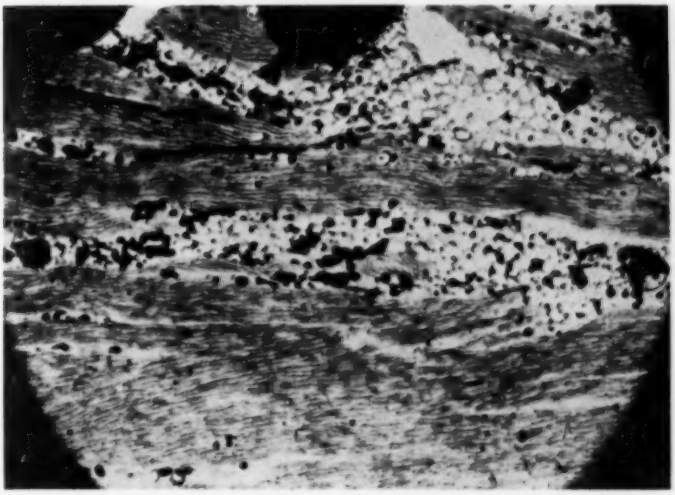
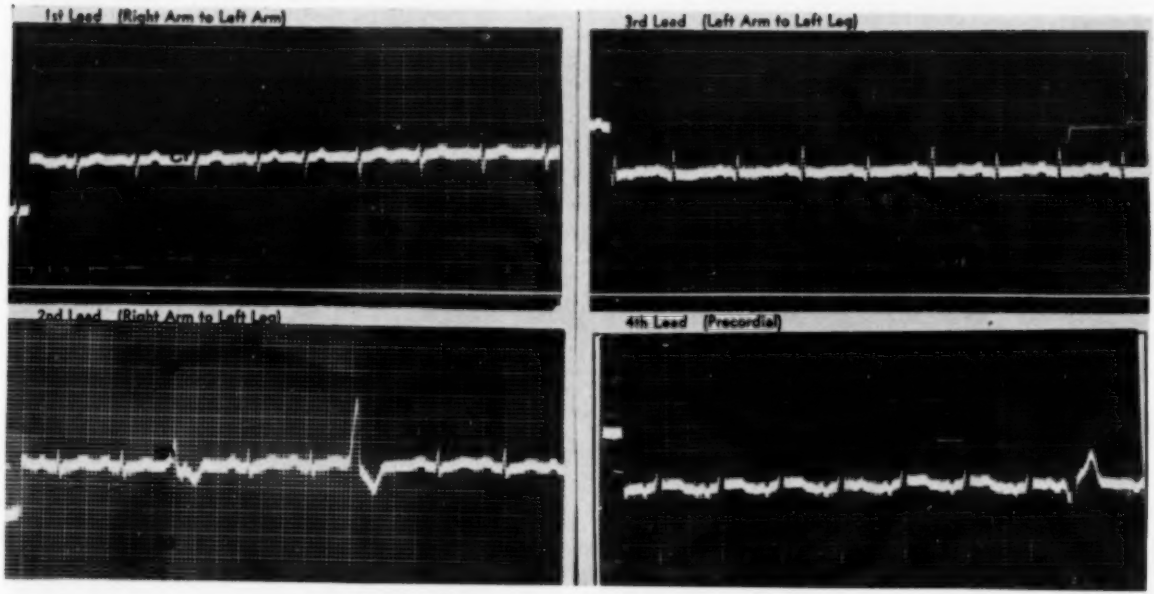
elevated blood pressure, and pretibial edema is not uncommon. The electrocardiogram may show an inverted QRS$_3$, the "T" wave in lead III may be inverted, and the presence of a "Q" wave in lead III may be significant. The x-ray inspection of the heart may also show that it is pushed up and apparently enlarged. All of the signs and symptoms presented by the patient are the result of the excess weight he carries, as well as the increased work placed on the heart by the larger blood volume associated with the obesity. Loss of weight through a reducing regime brings about a disappearance of the signs and symptoms enumerated above. In some types of obesity, the heart itself may actually play a role in the increased deposit of fat. Normally there is more adipose tissue on the right side of the heart than on the left. If the adipose tissue in the heart follows the course of the increase of adipose tissue throughout the body, then there will be a marked infiltration of fat on the right side of the heart. This infiltration may progress to the point of producing right heart strain and right heart failure. Here again, weight loss brings about a return of the cardiac function to normal, for just as the adipose tissue throughout the body decreases, so does the adipose tissue in the heart decrease.

Case 1: A white male, 65 years of age, entered the hospital for the last time on September 18, 1944. He had been a known alcoholic and glutton. At the time of his last admission he was in obvious congestive heart failure with anasarca. Examination revealed a markedly obese white



Case 1: Section through the right ventricle showing fatty infiltration.



Case 1: Electrocardiogram in adiposity of the heart.

male whose systolic blood pressure was 116 mm. and diastolic pressure 60 mm. of mercury, pulse rapid. The examination was handicapped because of the tremendous edema and obesity. In spite of treatments attempted the patient did not respond, and he died on November 1, 1944. The salient features of the autopsy, other than the edema and obesity, were found in the heart. It weighed 830 grams. The valves and coronary arteries were normal. The right ventricle was greatly hypertrophied and dilated. The left ventricle was hypertrophied. Microscopically there was marked fatty infiltration of the myocardium particularly on the right. The autopsy diagnosis was adiposity of the heart.

In severe toxic, anemic or infections states, fatty metamorphosis may occur within the heart muscle. These lipids may accumulate within the cell to such an extent as to interfere with the function of the cell, and thus cardiac failure may ensue. If the etiologic agent producing the fatty metamorphosis is a treatable lesion, then as the extracardiac lesion is cured, the secondary fatty metamorphosis within the heart is cured and the heart regains its function.

Acute blood loss produces marked cardiovascular symptoms in the form of shock. In addition, a precordial systolic murmur associated with the acute anemic state is not uncommon. With restoration of the blood volume both the symptoms of shock and the murmur disappear. In the chronic types of anemia not only may there be a systolic murmur over the precordium, but upon occasion a diastolic murmur may be heard over the pulmonary artery area. There is frequently an enlargement of the heart, and at times this hypertrophy may be very marked. The electrocardiographic tracings usually reveal nothing significant. Here again treatment of the underlying cause of the anemia usually restores the cardiac function to normal. It is also important to recognize the effect of even mild degrees of anemia upon patients with degenerative forms of heart disease, such as coronary sclerosis. Disease of the coronary arteries may not be sufficient to produce either signs or symptoms, as sufficient blood is still being supplied to the myocardium. However, when these patients develop anemia, the reduced oxygen-carrying power of the blood plus the mechanical interference with the circulation incidental to the coronary sclerosis may be sufficient to produce marked anginal symptoms and even myocardial infarction may result.

Case 2: A white male, school teacher, age 65 years, was first seen in November 1946, because of anginal pain. The patient's faither died of pernicious anemia. The electrocardiogram at this time revealed T_1 and T_4 inversions suggesting an old anterior myocardial infarction or left ventricular strain. The systolic blood pressure was 160 mm. and the diastolic blood pressure was 100 mm. of mercury. The physical examination and all other laboratory tests were normal except for achlorhydria. The chest x-ray film was normal. Pain was controlled by nitroglycerine. On

March 23, 1948 his wife phoned that he was very weak and that his anginal seizures were more frequent and more severe. On April 10, 1948 he was admitted to the hospital because of the severity of his anginal symptoms and weakness. Examination revealed no change from the previous visit. The blood pressure was 120/70, pulse 74. The chest plate remained the same. The electrocardiogram showed some changes that were not diagnostic. The hemoglobin was 58 per cent, the white blood count was 4,400 and the differential count was 48 per cent polymorphonuclear cells, 44 per cent lymphocytes, 7 per cent eosinophils and 1 per cent monocytes. The smear was characteristic of pernicious anemia. The remaining laboratory procedures were normal. The patient's hemoglobin slowly rose to 16.5 grams on anti-anemic treatment and he felt well. The electrocardiogram on May 26, 1948 suggested he had a myocardial infarction during this illness. The weakness disappeared, the anginal symptoms lessened and the patient returned to work.

The patient did not return for observation for 14 months, and when he was seen on November 30, 1949 he was acutely ill. He had neglected his treatment and was now in severe congestive heart failure with anasarca and anginal seizures occurring with the slightest effort. Examination revealed no significant changes other than the orthopnea and edema. The blood pressure was 148/80, pulse 92. The x-ray film of the chest remained the same. The hemoglobin was 6.7 grams, the red blood count was 1,880,000, the white cell count was 5,250 with lymphocytes 26 per cent, monocytes 4 per cent and neutrophils 70 per cent. The smear was typical of pernicious anemia. He responded well to anti-anemic therapy and was again able to enjoy increased physical activity although he was somewhat restricted.

Here again, recognition of the effect of the underlying anemia upon the previously diseased heart and the successful treatment of the anemia invariably lead to clinical improvement.

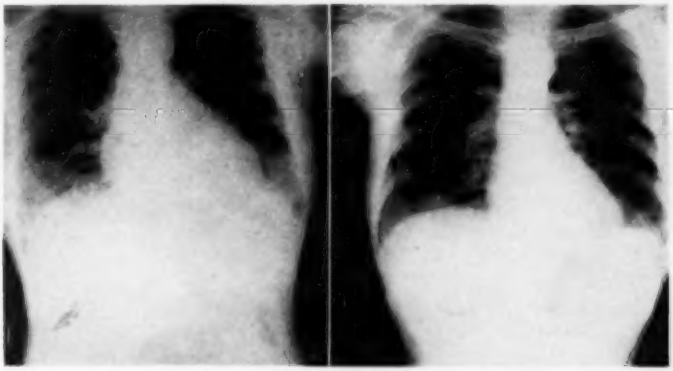
Avitaminosis, particularly deficiency in vitamin B, sometimes produces reversible changes in the cardiovascular system. This is particularly true in those individuals who are malnourished as a result of either chronic wasting diseases, self-inflicted starvation, or in the malnutrition secondary to chronic alcoholism. The diagnosis of beri-beri is made by having a high index of suspicion that such a condition may be present in malnourished cachectic patients. The diagnosis is frequently recognized when a patient with obvious heart disease fails to respond to the usual treatment of heart failure and then consequently responds when his diet is adequate and supplemented by vitamins.

Case 3: The patient was a white female, 54 years of age, who entered the hospital in October 1944, because of poor appetite, generalized edema and diarrhea. She had been a known diabetic. Examination revealed the systolic blood pressure to be 138 mm. and the diastolic blood pressure to be 78 mm. of mercury. Except for the anasarca the physical examination was negative. The venous pressure and circulation time were within normal limits. The rest of the laboratory procedures were within normal range except for a total blood protein of 6.8 grams per cent. Attempts to do gastro-intestinal x-ray inspections failed because of the patient's

inability to cooperate. A history of severe dietary inadequacy was obtained. Edema disappeared and the heart size returned to normal after 21 days of supernourishing, high vitamin regime.

The symptoms of beriberi heart disease may vary from simple tachycardia to very marked congestive heart failure. It is the failure of the patient to respond to the ordinary cardiac regime and his response to a high caloric, high vitamin regime that establishes the diagnosis of beriberi.

Some types of congenital heart disease are now cured by surgical intervention. The diagnosis of congenital heart disease can therefore no longer be considered of academic interest only. Patent ductus arteriosus, which is essentially an arteriovenous fistula between the aorta and the pulmonary artery, is readily cured by surgery. This fistula, serving a useful purpose in intrauterine life, may persist after the first year of life and produce symptoms and cardiovascular distress. The diagnosis is apparent because of the machinery hum murmur over the base of the heart, a high pulse pressure, absence of cyanosis, and usually the presence of a normal electrocardiogram. Surgical closure of the ductus brings about a complete relief of the cardiovascular symptoms. Should bacterial endarteritis be present, the combination of operation with antibiotics and chemo-therapy also cures the condition. Coarctation of the aorta is an easily diagnosed condition when it is recalled that in this disease there is hypertension in the upper extremities and hypotension in the lower extremities. Various murmurs may be heard, but the diagnosis depends upon determining the presence of the hypertension in the upper extremities and the hypotension in the lower extremities. This is easily accomplished by simul-



Case 3: Cardiac enlargement which disappeared on a high vitamin diet.

taneously palpating the radial and femoral arteries during every routine examination.

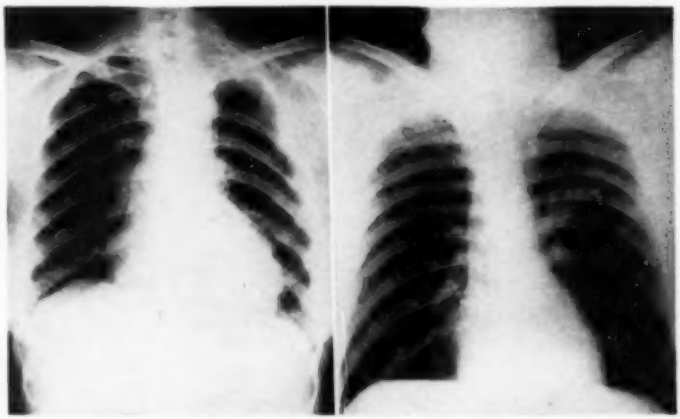
Case 4: A 25 year old white female was admitted to the obstetrical service in March 1940. She had been told that she had hypertension and rheumatic heart disease. Physical examination revealed systolic and diastolic aortic murmurs. The systolic blood pressure was 180 mm. and the diastolic blood pressure was 100 mm. of mercury. There was no pulsation in the femoral arteries. X-ray film inspection revealed the characteristic notching of the ribs. The patient recently underwent a surgical resection of the coarctated area with excellent results.

The removal of the coarctation with the end-to-end anastomosis of the aorta effects a cure in these patients. Cyanotic heart disease is omitted in this discussion, for the procedures are palliative rather than curative. Anomalous vessels occurring about structures in the neck are also easily diagnosed and easily cured by the surgeon.

Arteriovenous fistulas may be either acquired or congenital. In either event, they may produce marked disturbances in the cardiovascular system. The diagnosis of the arteriovenous fistula and then the surgical correction of the lesion results in the disappearance of the cardiovascular symptoms.

*Case 5:** A white male, age 29 years, entered the hospital on June 6, 1944 because of high temperature, petechial hemorrhages and convulsions. A chest x-ray film on June 10, 1944 showed an infiltration extending out

*Case previously reported.



CASE 4 CASE 5

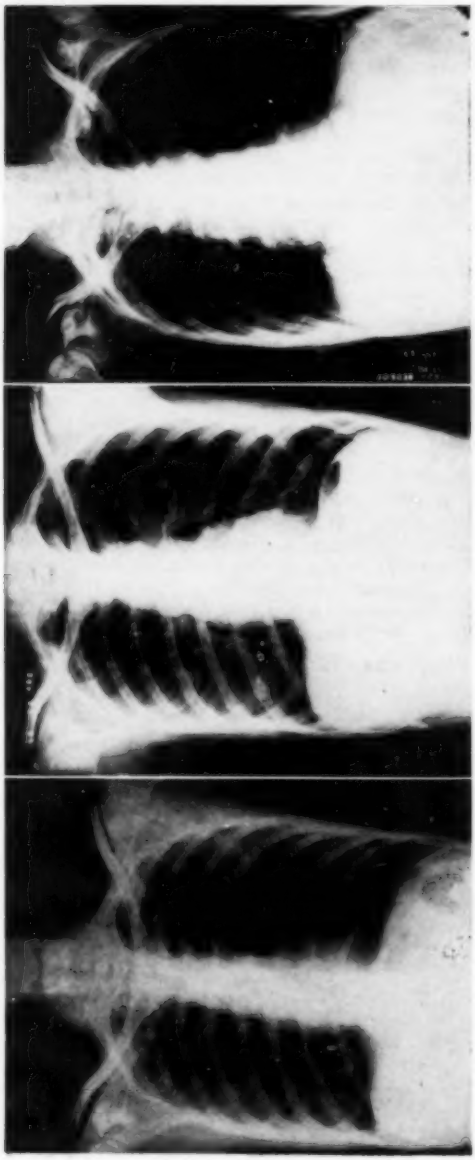
Case 4: Coarctation of the aorta with rib notching being present.
Case 5: Lesion in the left apex which was later found to be an arteriovenous fistula.

from the left hilus into the left apex. It suggested the appearance of either pneumonia or tuberculosis. The diagnostic survey did not establish the cause of the infiltration. The patient returned in December 1946, and a systolic bruit was heard over the left apex. The quality of the bruit changed with respiration and the examiner suggested the diagnosis of pulmonary arteriovenous fistula. Special x-ray studies confirmed this impression, and a review of the entire record brought out a familial history of telangiectasis, thence the ultimate diagnosis of congenital familial telangiectasis was made. The patient refused surgical treatment. In this instance the roentgenologist by virtue of a special x-ray study played an important part in the solution of this problem.

Endocrine disturbances are frequently associated with marked changes in the cardiovascular system. Addison's disease with associated hypotension, small heart, and signs of peripheral collapse is familiar to all of us. With the use of proper cortical extracts, saline solutions and the like, the cardiovascular symptoms promptly disappear, the blood pressure returns to normal and the heart returns to normal size.

Case 6: A 43 year old white female entered the hospital on July 26, 1946 with marked weakness, hypotension, vascular collapse and pigmentation of the buccal mucosa. She had been under observation elsewhere to establish the diagnosis of pulmonary tuberculosis. Immediate treatment directed toward the Addisonian crisis brought the heart back to normal size, her asthenia disappeared and the blood pressure returned to normal. Excessive endocrine therapy led to cardiac enlargement which disappeared with control of the adrenal therapy. (See illustration).

Hyperfunction of the adrenal gland in the form of a pheochromocytoma causes vascular crises, paroxysmal or prolonged hypertension, headaches, collapse, et cetera. Here again, recognition of the tumor and its surgical removal brings about relief. Hyperthyroidism may express itself through the cardiovascular system in the form of simple tachycardia, paroxysmal tachycardia, paroxysms of auricular fibrillation or even persistent auricular fibrillation. It is not uncommon to have a slight elevation in the systolic blood pressure, and the patient may be dyspneic as a result of the increased demand for oxygen. Proper preparation of the patient and surgical removal of the diseased gland relieves the symptoms. At times, a mild hyperthyroidism may be sufficient to precipitate severe heart failure in the middle-aged or aged person with degenerative heart disease. Here again, relief of the hyperthyroidism aids in the return of the cardiac function to its previous state. Myxedema is not an uncommon disease. The symptoms and signs of myxedema are manifold and often involve the cardiovascular system. These patients frequently have a very characteristic type of electrocardiographic tracings with low voltage and low voltage "T" waves or even inversion of the "T" waves.



Case 6: Changes in heart size during treatment for Addisonian crisis.

Case 7: A white, widowed female, age 64 years, entered the hospital in October of 1948. She complained of severe chest pain and palpitation. She had had hypertension for about 10 years and with the hypertension she had anginal seizures. The anginal seizures had increased in severity during the last two years necessitating prolonged periods of bed rest. In addition to this, she noticed marked dyspnea on exertion. She also developed edema and signs of congestive failure. In spite of the use of digitalis and other means to combat congestive failure, the condition worsened and the anginal seizures increased in severity. For some six to eight months the patient had been practically bed ridden by virtue of the anginal seizures. Physical examination at this time revealed the blood pressure to be 176/105, pulse 88 and regular. She had the classical picture of a myxedema despite the presence of a large adenomatous goiter in her neck. The physical examination was otherwise negative with the exception that the basal metabolic rate was minus 26 per cent and the blood cholesterol varied from 460 mgm. to 505 mgm. She did not respond to digitalis therapy and the usual measures for the treatment of congestive failure. In the presence of myxedema, thyroid was administered. The response was prompt, and within four weeks she was able to be up and around. She has remained well since that time and is now able to be up most of the day. She has very few seizures of angina and seems to be clinically well. This patient illustrates well the effect of myxedema on a heart already damaged by virtue of hypertension and coronary disease. With the treatment directed to the myxedema she made a prompt and uneventful recovery with the restoration of function to the heart to what it was before the onset of the myxedema.

Treatment with thyroid gland invariably relieves the cardiovascular symptoms.

We can no longer consider that hypertension is incurable. Hypertension associated with coarctation of the aorta, with arteriovenous fistula, with hyperthyroidism, with pheochromocytomas, with unilateral renal disease and certain types of kidney tumors can be cured by appropriate surgical treatment.

Formerly, acute bacterial endocarditis, subacute bacterial endocarditis and the acute and subacute forms of endarteritis, were almost always fatal.

Case 8: A married white woman, 26 years of age, entered the hospital in May 1946, because of chills and fever. Her temperature would be elevated to 105 degrees F. Physical examination revealed an acutely ill white female covered with petechiae. The examination was negative except for the following: A precordial systolic murmur was present, the spleen was enlarged, there was bleeding from the uterus. The patient denied pregnancy but shortly after admission to the hospital she passed a macerated piece of placenta. She continued to deny pregnancy or any attempt at abortion. She responded to antibiotic therapy. The spleen returned to normal and the systolic murmur disappeared. The blood cultures were negative. At the time of admission to the hospital it was felt that she had an acute bacterial endocarditis secondary to an infected abortion. She made an uneventful recovery. The patient finally admitted the use of sulfanilamide drugs before entering the hospital. This probably explained the negative blood cultures.

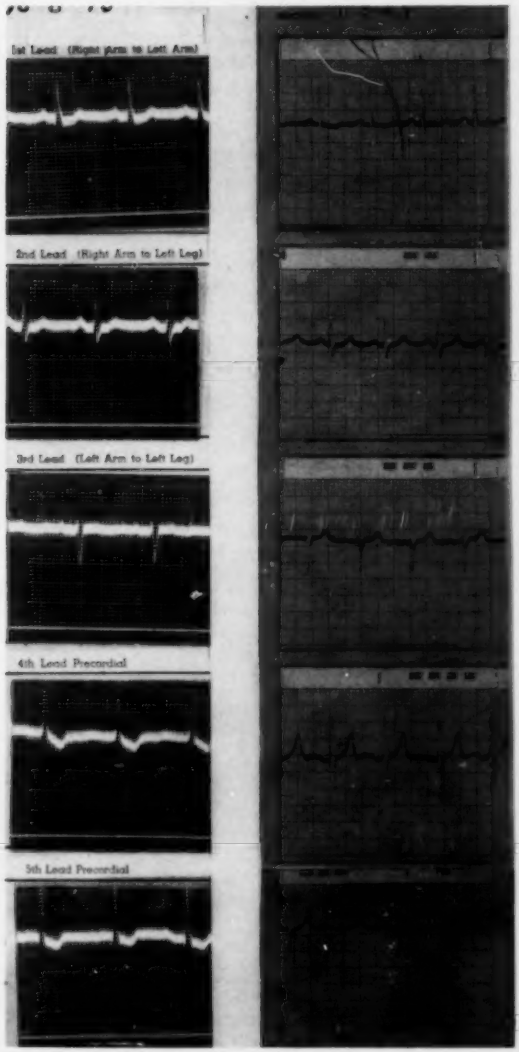
Case 9: A white male, 37 years old, entered the hospital in March 1946, with a diagnosis of rheumatic fever. He had known of a rheumatic aortic valve defect since the age of 12 years. In December 1946, he was treated for the "flu" and since then he had recurrent febrile episodes with joint pain. On admission his temperature was 99.4 degrees F., the blood pressure was 140 mm. systolic and 60 mm. of mercury diastolic. The only physical findings of note were systolic and diastolic murmurs over the aortic area and the presence of petechiae in the conjunctiva. The blood cultures were positive for streptococcus hemolyticus. Penicillin therapy brought about a remission and he has remained well without recurrences to the present time, June 1950.

With the advent of antibiotics and chemotherapy, many of these patients are promptly cured and are returned to an active normal life, and the heart and the cardiovascular system may be returned to its previous state.

Pericarditis is not an uncommon disease, and the acute forms are easily recognized and usually heal spontaneously. There is one form, the idiopathic relapsing type of pericarditis, which simulates coronary thrombosis with myocardial infarction. Failure to recognize that the lesion is pericardial rather than myocardial may lead to invalidism. The disease is readily diagnosed by the history, by the physical findings and by the electrocardiographic tracings which reveal the signs associated with pericarditis. This condition also leaves no residue, and the patient, after the acute illness has subsided, may have a normal cardiovascular system.

Case 10: A white male, age 35 years, was admitted to the hospital on July 19, 1948 because of severe precordial pain and dyspnea. He had been perfectly well until the day of admission when he was seized with a severe precordial pain radiating into both arms. The pain was worse with

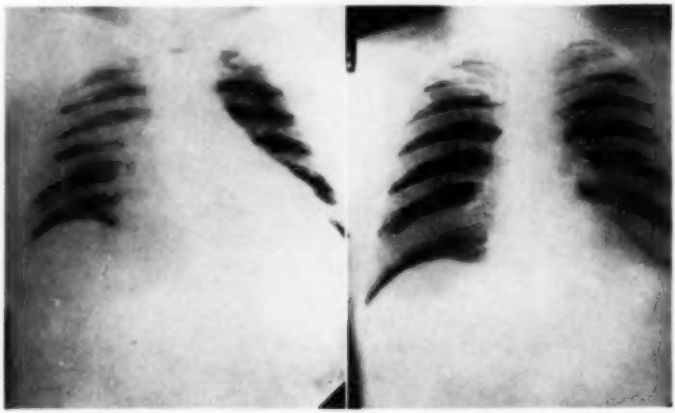
Case 7: Serial x-ray films in a patient with myxedema demonstrating the improvement in the heart size with thyroid therapy.


1st Lead (Right Arm to Left Arm)
2nd Lead (Right Arm to Left Leg)
3rd Lead (Left Arm to Left Leg)
4th Lead Precordial
5th Lead Precordial

Case 7: The electrocardiographic records of a patient with myxedema revealing the return of the T waves to normal upon thyroid therapy.

swallowing and could be relieved or aggravated by changes in position. His blood pressure was within normal limits, the temperature was elevated at times and a loud harsh friction rub could be heard over the entire precordium. He recovered without any residual of the pericarditis but subsequently had five more such seizures. At the present time he is well and has no evidence of myocardial involvement. This type of idiopathic, recurring pericarditis is often confused with coronary artery disease.

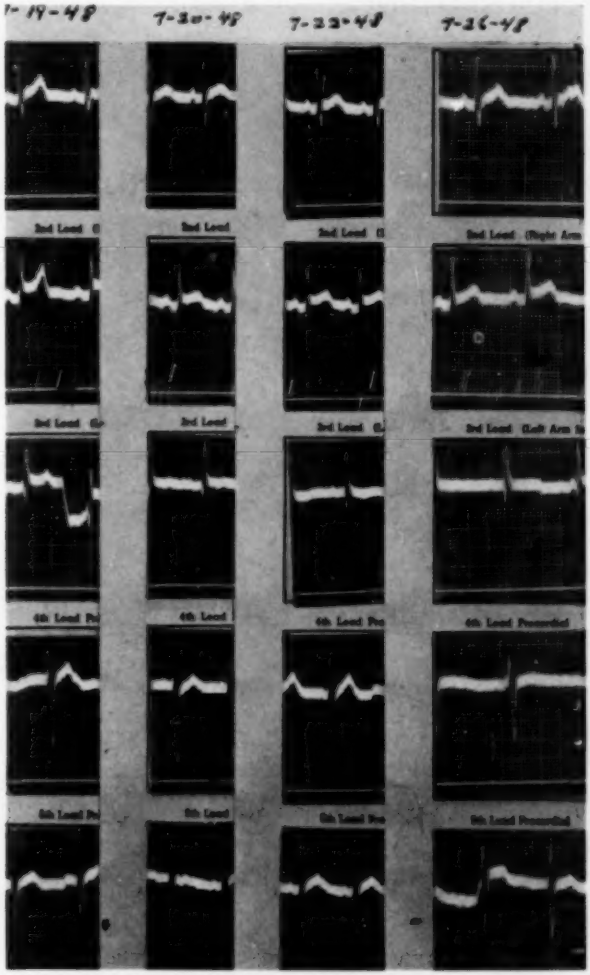
It is possible for a chronic type of pericarditis to develop and over a period of years the increase in fibrous tissue compresses and constricts the heart. This constriction may develop to such an extent that it interferes with cardiac function. When it does so, the venous pressure becomes elevated, the peripheral pulse becomes small and systemic blood pressure falls. There is an increasing amount of edema, the liver enlarges, and the symptoms resemble those of cirrhosis of the liver. The triad of the increased venous pressure, the small peripheral pulse and the decreased systemic blood pressure suggests the diagnosis. On physical examination, the heart is usually small, murmurs are seldom heard and the heart is frequently silent. On fluoroscopic examination the heart seems to pulsate but little. An electrocardiogram has a characteristic pattern. Recognition of the syndrome, surgical removal of the constricting pericardium relieves the condition. Acute cardiac tamponade may occur either as the result of infections or injury to the pericardium and the like. Here, as a result of the rapid accumulation of fluid within the pericardial sac, the heart is compressed and we have a rapid rise in the venous pressure, a fall in the systemic blood pressure and a very weak and rapid



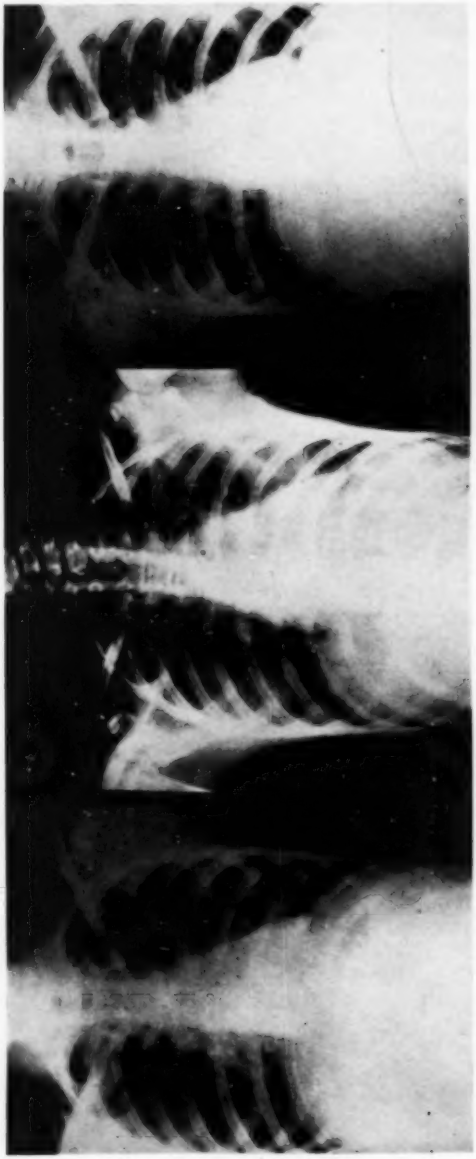
Case 10: These films demonstrate the evanescent changes associated with acute idiopathic pericarditis.

pulse. The cardiac silhouette is enlarged on x-ray inspection and physical examination. Removal of the fluid, either by paracentesis or by surgical means, relieves the condition.

Pulmonary heart disease in the acute form is best recognized in the form of pulmonary infarctions. Here acute right heart strain results from the pulmonary embolic phenomena. The diagnosis is



Case 10: Characteristic electrocardiographic patterns in acute relapsing idiopathic pericarditis.



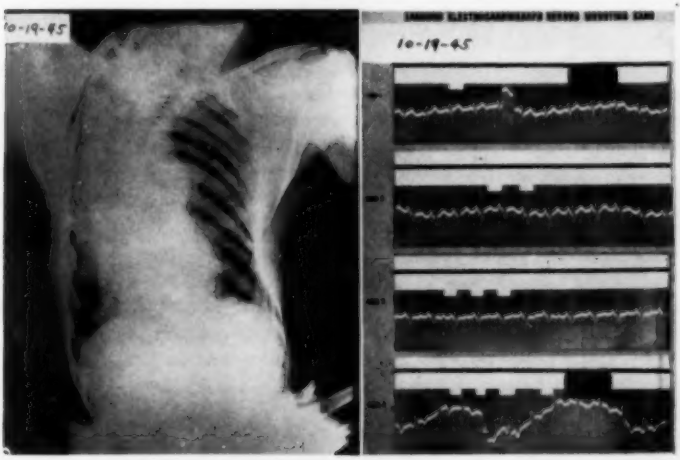
Case 11: The middle film illustrates the enlarged pulmonary conus during the period of acute right heart strain in a case of proven psittacosis.

frequently made from the history of a recent surgical procedure or long confinement to bed from one cause or another; the patient suddenly experiences severe chest pain, goes into collapse, becomes cyanotic and even moribund. The symptoms are quite distinct from those of coronary thrombosis. Here the electrocardiogram has also a characteristic pattern, and treatment directed to support the cardiovascular system usually results in recovery.

*Case 11:** This is the case of a white boy, 15 years of age, with proved psittacosis. During the course of his illness (see illustration, Case 11) he suddenly became very dyspneic, the pulmonary second sound became accentuated and he developed signs of right heart strain. The illustration shows enlargement of the conus area. Supportive treatment was rendered and the patient made an uneventful recovery.

Acute right heart strain is not uncommon in severe pneumonic processes. Some forms of chronic cor pulmonale are reversible. The accompanying right heart strain is secondary to some chronic disease of the lungs or thoracic cage. It is possible that antibiotics, chemotherapy, or surgical procedures administered for the lesions of the lungs or the thoracic cage may bring about a relief of the right heart strain. Many mechanical disturbances of the thoracic cage may produce profound alterations in the cardiovascular function. These are best seen in individuals with kyphoscoliosis, or in those who suffer from acute compression of the mediastinum and

*Case previously reported.



Case 12: The chest film and electrocardiogram in chronic cor pulmonale secondary to asthma, emphysema and severe kyphoscoliosis.

heart as a result of injury or displacement of the heart from any cause.

Case 12: This white male, 24 years of age, had suffered from asthma since the age of two years. The attacks were mild and he was not too incapacitated by them. In 1938 he suffered an attack of anterior poliomyelitis that left him with a severe degree of kyphoscoliosis. Since then he was required to wear a leather corset to support his chest. The asthmatic seizures increased in severity until finally he had constant asthmatic breathing. He soon developed emphysema and cor pulmonale. When his chest support was removed, a loud second pulmonic sound could be heard and a pulmonary diastolic murmur would be present. The patient died suddenly on January 26, 1947 and the autopsy revealed in addition to the chest deformity and emphysema of the lungs a dilated pulmonary artery with a congenital bicuspid pulmonic valve as well as right heart hypertrophy. This case illustrates the effect of chronic infectious asthma, emphysema and kyphoscoliosis on the right heart. Today the use of antibiotics at the onset of the lung infection and/or the surgical correction of such chest deformities may relieve or prevent such right heart strain.

Here again, treatment directed toward the offending mechanical agent will usually relieve the cardiovascular symptoms.

SUMMARY

In conclusion, some examples of cardiovascular disease have been listed wherein the heart itself may be normal or only slightly diseased, but by virtue of extrinsic factors acting upon the heart or through the cardiovascular system, the heart is precipitated into severe congestive heart failure. As a result, the patient may become invalided and even may die as a result of this disturbed cardiovascular function. If recognition of the extracardiac disease is made early before structural changes in the heart become irreversible, treatment of the extracardiac disease will usually result in cure. Failure to recognize extrinsic factors as they express themselves in the cardiovascular system usually leads to irreversible changes in the cardiovascular system with ultimate cardiac death. The saying is applicable to the heart that it is more often sinned against than sinning.

RESUMEN

Se trata de algunos ejemplos de enfermedad cardiovascular en las que el corazón mismo puede ser normal o con ligeras alteraciones patológicas, pero que en virtud de ciertas condiciones extrínsecas que actuan sobre el corazón o por intermedio del aparato cardiovascular, el corazón es precipitado en la insuficiencia congestiva grave.

Como resultado el enfermo puede quedar inválido o aún morir. Si la afección extracardiaca no es reconocida a tiempo, los cam-

bios estructurales pueden convertirse en irreversibles, en tanto que el tratamiento de la afección extracardiaca puede acarrear la curación. Puede aplicarse el dicho de que más se peca contra el corazón que el corazón mismo peca.

RESUME

L'auteur a consigné certains exemples d'affection cardiovasculaire dans lesquels le coeur lui-même peut être normal ou peu atteint, mais où cependant par l'action de facteurs extrinsèques, on peut voir survenir une sévère asystolie. Ces troubles de la fonction cardio-vasculaire peuvent entrainer pour le malade una véritable infirmité, ou même la mort. Si l'on peut mettre en évidence l'affection extra-cardiaque avant que les altérations de la structure du coeur deviennent irreversibles, on obtiendra généralement une guérison par le traitement de la maladie extra-cardiaque. Si l'on ne sait pas reconnaitre ces facteurs extrinsèques, des altérations irréversibles surviennent dans l'appareil cardio-vasculaire et entrainent finalement la mort.

Discussion

ARLIE R. BARNES, M.D.
Rochester, Minnesota

It is important that we be reminded of forms of heart disease due to extrinsic factors, the correction of which may bring about a reversal of cardiac damage. We should all be grateful to Dr. Briggs for this excellent presentation.

How shall we, as clinicians, alert ourselves in our daily practice to the presence of these extrinsic factors? It is unlikely that we shall review all the possibilities in our minds as we consider each patient. It seems more likely that we shall be reminded of these factors by their stigmas as revealed in our clinical examination.

On examination of our patients, pallor may denote anemia or myxedema. The presence of cyanosis indicates the possible existence of certain types of congenital heart disease. A café-au-lait tint to the skin may be a signal of subacute bacterial endocarditis as are petechiae with yellow centers. Engorgement of the veins of the neck in the absence of other explanations demands the exclusion of constrictive pericarditis. Ascites disproportionate to other evidences of edema and not attended by orthopnea has a similar connotation. Visible pulsation of the superficial arteries over the scapular region occasionally is observed and when present, denotes the existence of coarctation of the aorta. Fine tremors of

the fingers should arouse the suspecion that hyperthyroidism exists.

Attention to the condition of the skin may be rewarding. A warm, moist, smooth skin is characteristic of hyperthyroidism; a pallid, dry, scaling skin and lifeless hair is suggestive of myxedema, especially when coupled with edema of the face and hands.

On palpation, pulsations felt over the scapular areas and absence of pulsation in the abdominal aorta and femoral vessels usually indicate the presence of coarctation of the aorta. Thrills felt over the pulmonic area of the heart and to the left of the sternum in the third and fourth interspaces are suggestive of types of congenital heart disease.

The state of nutrition should be noted. Obesity will be obvious. Evidence of malnutrition, especially when coupled with alcoholism raises the possibility of deficiency of vitamin B and its possible relation to heart failure. When a patient with heart failure exhibits evidence of marked loss of weight of recent origin, hyperthyroidism must be excluded.

If loss of muscle strength is manifested by a patient's inability to mount the step of the examining table without helping himself or being helped, hyperthyroidism must be suspected.

Vigorous patellar reflexes are characteristic of hyperthyroidism whereas sluggish patellar reflexes accompanied by slow recovery of their phase of relaxation are characteristic of myxedema.

These are only a few of the signals that may be noted by the clinician and call attention to the possible presence of extrinsic causes of heart disease which Dr. Briggs has so ably reviewed. All of you can amplify this list. The recognition of these extrinsic causes of heart disease will be proportionate to the keenness of clinical observation, to the alertness of the clinician to the significance of the phenomena observed and to the height of his index of suspicion. Failure to recognize these extrinsic factors is especially tragic since the patient is denied the relief of his heart disease that is afforded by correction of the extracardiac causes.

CLOSING REMARKS

John F. Briggs, M.D.: In concluding this discussion I desire to pay particular tribute to Dr. Arlie Barnes, for it was his early emphasis on the curability and the reversibility of certain types of heart disease that brought it to my attention. If this essay and Dr. Barnes' discussion do nothing else, I do hope it emphasizes the basic principle of Dr. Barnes' philosophy, namely, that one should be a physician first and a cardiologist second.

Oleothorax Following Pulmonary Resection*

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Thoracoplasty has been generally accepted as the method of choice for the prevention of mediastinal shift and the resultant disturbances in cardiorespiratory function which may follow pneumonectomy in the adult. While in most patients this additional surgical procedure is well tolerated, either as a concomitant or subsequent operation, there are some patients in whom thoracoplasty is inadvisable because of debility, advanced age, or poor prognosis, while in others it is refused by the patient or temporarily deferred by the surgeon. For these patients, an easily tolerated method of preventing overdistention of the remaining lung and shift of the mediastinum should be considered. Ideally, this procedure should be simple in application, minimally traumatic, and easily discontinued if necessary.

The constant search for an ideal intrapleural space-filling substance, which could be used as a substitute for thoracoplasty in the compression treatment of tuberculosis, and more recently as a method of filling the pleural space after pneumonectomy, indicates that many investigators do not consider thoracoplasty an altogether satisfactory procedure.

Johnson, Kirby, Lazatin and Cocke[1] have used a solitary large hollow metal prosthesis of zirconium, as well as multiple small hollow spheres of methyl methacrylate in the pleural space in dogs. They favor the latter because of minimal pleural reaction. These authors recently[2] have reported upon the use of the spheres in eight patients without apparent complications.

Small, Clagett, and Grindlay[3] used gelatin foam sponges in the pleural space following pneumonectomy in dogs and rats, and found that although the material was absorbed, postoperative shift of the mediastinum was prevented. More recently, Grindlay, Clagett and Rydell[4] reported upon the use in dogs of a heat-sealed Polythene film bag filled with fiber glass and air which was made roughly the size and shape of the pleural cavity. These investiga-

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*From the Department of Research Surgery of The Ohio State University, Columbus, Ohio. Aided by a grant from the Comly Fund for Research of The Ohio State University.
Presented at the 16th Annual Meeting of the American College of Chest Physicians, San Francisco, California, June 25, 1950.

TABLE I

Case	Age, Sex	Diagnosis	Date of Operation	Post-Operative Complications
1. GV	66 M	Bronchogenic carcinoma	8/16/49	None
2. OM	58 M	Bronchogenic carcinoma	3/ 3/49	Staph. aureus empyema, broncho-pleural fistula
3. HD	55 M	Bronchogenic carcinoma	7/30/49	None
4. OS	47 M	Bror.chogenic carcinoma	8/25/48	Staph. aureus empyema, pleuro-cutaneous fistula
5. HG	58 M	Bronchogenic carcinoma	4/18/49	Broncho-pneumonia
6. JH	50 M	Bronchogenic carcinoma	8/29/49	None
7. GS	55 M	Bronchogenic carcinoma	2/18/49	None
8. CB	55 M	Bronchogenic carcinoma	3/15/49	None
9. RB	49 M	Bronchogenic carcinoma	12/ 7/48	None
10. GJ	52 M	Bronchogenic carcinoma	9/13/49	None
11. JL	50 M	Bronchogenic carcinoma	10/ 6/49	None
12. OS	65 M	Bronchogenic carcinoma	4/12/50	Emphysema remaining lung
13. CB	3 F	Tuberculous bronchiectasis	2/18/50	None
14. JM	31 F	Tuberculous bronchostenosis	3/19/45	TBC empyema, contralateral spread
15. JC	32 F	Tuberculous bronchostenosis	2/18/49	Contralateral spread of TBC
16. IS	39 F	Tuberculous bronchostenosis	11/16/48	None
17. IK	48 F	Tuberculous bronchostenosis	8/25/49	None
18. SV	58 F	Tuberculous bronchostenosis	2/ 3/50	None
19. JG	22 F	Bronchial adenoma	1/17/49	None
20. VJ	32 F	Congenital cystic disease	11/ 6/48	Strep. hemolyticus empyema, broncho-pleural fistula

REMARKS:

Case 1. Expired, 2/25/50.
Case 2. Expired, 10/49.
Case 3. Contralateral spread of carcinoma.
Case 4. Thoracoplasty, 2/9/50.
Case 5. Reestablishment of oleothorax, 9/9/49.
Case 6. Working.
Case 7. Expired, 4/18/50.
Case 8. Working.
Case 9. Expired, 2/49.
Case 10. Spread of carcinoma to brain.

TABLE I

	OLEOTHORAX			
Case	Date	Amn't. in ML of Oil	Complication	Bacteriology
1.	9/10/49	1,500	None	——
2.	7/ 1/49	705	None	——
3.	9/28/49	725	Hydrothorax	Sterile
4.	9/23/49	250	Empyema, pleuro-cutaneous fistula	Staph. aureus
5.	6/ 5/49	350	Empyema, broncho-pleural fistula	Sterile
6.	10/ 7/49	225	None	Staph. aureus
7.	6/ 5/49	800	None	Sterile
8.	5/15/49	900	None	Sterile
9.	1/11/49	755	None	——
10.	10/18/49	825	None	——
11.	11/22/49	1,200	None	Sterile
12.	5/20/50	850	None	——
13.	3/ 4/50	160	None	——
14.	5/20/45		None	——
15.	3/13/49	320	None	Sterile
16.	1/ 8/49	905	None	——
17.	10/ 3/49	250	None	Sterile
18.	3/ 4/50	850	None	——
19.	3/19/49	575	None	C. diphtheria
20.	1/17/49	505	None	——

REMARKS:

Case 11. Working.
Case 12. Improved.
Case 13. Apparently well.
Case 14. Apparently well.
Case 15. Apparently well.
Case 16. Apparently well.
Case 17. Apparently well.
Case 18. Apparently well.
Case 19. Apparently well.
Case 20. Apparently well.

tors are now studying a hollow molded one-piece prosthesis of methyl methacrylate.

Cournand and Berry,[5] while studying pulmonary function following pneumonectomy, used oleothorax in one case to maintain the mediastinum in the midline and to prevent overdistention of the remaining lung. One year following establishment of the oleothorax, the maximum breathing capacity with one lung was almost identical to that obtained with two lungs prior to surgery.

Overholt and Langer[6] in discussing the problem of overdistention of the remaining lung following pneumonectomy favor the use of thoracoplasty, but state that air and oil have been used and are usually well tolerated by the patient. However, they warn that a foreign body in the pleural space introduces definite hazards such as infection and bronchopleural or pleurocutaneous fistulae.

The use of oil as a prosthesis in the pleural space has definite advantages over solid space-filling devices in that the oil is pliable, conforms easily to any sized cavity, and lacks friction points which might erode vital structures. Although oleothorax fell into disrepute in the compression treatment of tuberculosis because of complicating bronchopleural and pleurocutaneous fistulae, these may have been due to concomitant infection in the pleural space or lung parenchyma.

At the Ohio State University hospitals, during the past six years, a series of 20 cases has been accumulated in which oleothorax has been used following pneumonectomy. The patients selected for this procedure had previously been subjected to pneumonectomy for bronchogenic carcinoma, tuberculosis, bronchial adenoma, or congenital cystic disease of the lung (Table I).

Method

In order to maintain all factors as constant as possible for the analysis of these cases, the following routine measures were agreed upon and followed in the majority of them.

A) *Pneumonectomy:*

Silk suture was used throughout the procedure. The bronchus was closed with a single row of interrupted 00 silk. When possible pleura was approximated over the sutured end of this structure.

All patients received penicillin and streptomycin both systemically and by aerosol 48 hours prior to operation. These antibiotic drugs were given systemically during the postoperative period until such time as the temperature had been normal for 24 hours.

B) *Oleothorax:*

Four to six weeks following pneumonectomy, the patient was hospitalized for three days. Upon admission, an x-ray film was

taken to estimate the size of the pleural space, the amount of pleural fluid and the position of the mediastinum. Thoracentesis was then done utilizing sterile precautions. The pleural fluid which was removed and submitted for bacteriological study was replaced with air and 25 milliliters of sterile olive oil. If there was no evidence of organisms in the pleural fluid by smear, 300 to 400 milliliters of oil was introduced into the hemithorax on the second hospital day. Fluoroscopy was done on the third day to estimate the additional amount of oil needed to fill the pleural space. If necessary, this was introduced and a roentgenogram taken for final evaluation. In order to avoid increased pressure upon the mediastinum and leakage of oil back through the needle tract, the oil was never injected into the pleural cavity against positive pressure.

All patients were instructed to lie on their operated side if they should at any time notice the presence of oil in their sputum. They were instructed to return in one month for x-ray studies to ascertain the position of the mediastinum following absorption of the small apical cushion of air residual from the last thoracentesis. At that time oil could be added or removed as indicated by the position of the mediastinum.

The material used in this study was commercial olive oil which had been sterilized by dry heat for three hours at 160 degrees C. and allowed to cool to room temperature. Bacteriological study of samples of oil so treated showed this time and temperature adequate for sterilization. Immediately prior to introduction into the pleural space, 100,000 units of penicillin in oil was added to each 100 milliliters of olive oil.

Results

Although thoracoplasty was considered, particularly early in this study, as the ideal method to obliterate the pleural space which remains following pneumonectomy, 20 patients were selected for oleothorax and have been followed for a period of from six years to one month. The selection was based on: (a) poor prognosis, (b) refusal to accept thoracoplasty, or (c) because thoracoplasty was considered hazardous at the time of pneumonectomy or during the early postoperative period.

These 20 cases have been divided into three groups based upon the primary disease for which pneumonectomy was done.

1) *Bronchogenic Carcinoma:*

Twelve cases included in this group were all males ranging in age from 47 to 67 years. They were selected for oleothorax because of a relatively poor prognosis which was manifested by lymph node

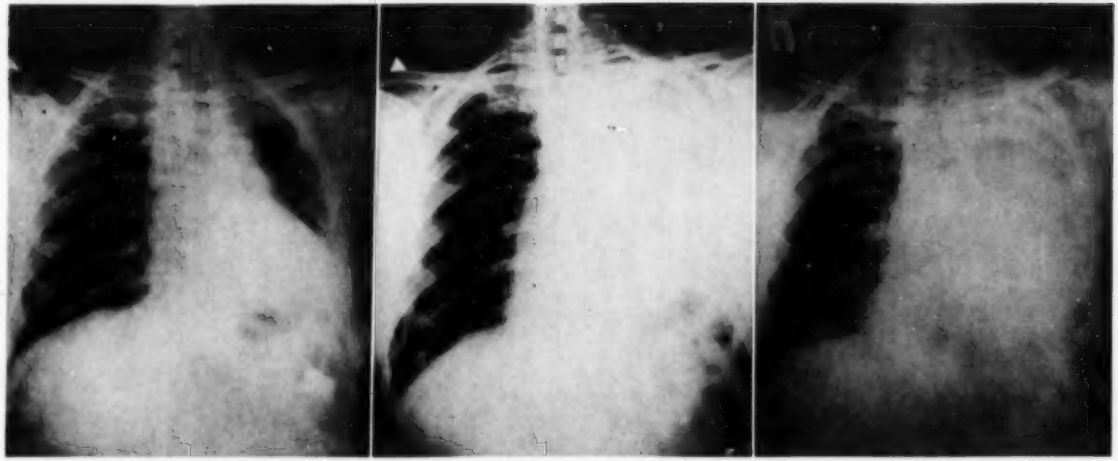

FIGURE 1 FIGURE 2 FIGURE 3

Figure 1, Case 1: Post-operative film showing shift of the heart and mediastinum toward the empty pleural space.—*Figure 2, Case 1:* Following oleothorax, the trachea is again in the midline and the heart has returned to a more normal position.—*Figure 3, Case 1:* Five months following pneumonectomy for bronchogenic carcinoma. Metastatic nodules are present in the right lung field.

metastases in seven instances, lack of differentiation of the carcinoma in three, and tumor thrombus, or invasion of the chest wall in the remaining two cases.

Four patients in this group have expired as the result of extension of their diseases, two, six, seven and 10 months after pneumonectomy. While three of these patients died at home, the fourth was admitted to another hospital by his physician. Postmortem examination was performed but the pathologist was unaware of this study. Two of these four cases are presented.

Case 1: G.V., a 66 year old white male was admitted to University Hospital on August 10, 1949, with a tentative diagnosis of bronchogenic carcinoma. Six days later, a left pneumonectomy was done for a poorly differentiated squamous cell carcinoma with regional lymph node involvement. Postoperative course was complicated by congestive heart failure on the third day which responded to digitalization. Four weeks following pneumonectomy he was readmitted to the hospital for oleothorax. An x-ray film of the chest (Figure 1) showed the presence of pleural effusion and pneumothorax with some shift of the mediastinum to the operated side. On the following day, 300 milliliters of serous fluid was removed from the left chest and submitted for bacteriological study. Twenty-five milliliters of sterile olive oil was placed in the pleural space. The smear of the chest fluid contained no bacteria and 425 milliliters of sterile olive oil was introduced into the pleural space on the second hospital day. The next day, following fluoroscopy, an additional 650 milliliters of oil was placed in the hemithorax. X-ray films (Figure 2) taken before discharge showed the left hemithorax to be filled with oil except for a small apical cushion of air. The mediastinum had returned to the midline.

Four and one-half months following pneumonectomy he complained of a slight but increasing dyspnea. X-ray film (Figure 3) showed multiple areas of metastatic carcinoma in the right lung field. Two weeks later he was admitted to another hospital, following a cerebral vascular accident. His course was gradually downhill and he expired five weeks after admission. Postmortem examination showed the right lung to contain multiple metastatic carcinomatous nodules. Examination of the left hemithorax showed the lung to be surgically absent and the pleural cavity to be filled with approximately 1,000 milliliters of light yellowish-green oil. The left parietal pleura was somewhat thickened but was smooth and glistening. No statement was made about the condition of the left main bronchus, nor were microscopic sections of the pleura obtained.

Case 2: O.M., a 58 year old white male entered University Hospital on March 3, 1949 and 12 days later right pneumonectomy was done for an undifferentiated bronchogenic carcinoma. Four weeks later he was readmitted because of cough, hemoptysis, and fever of two days duration. Thoracentesis of the right pleural space revealed a thick, greenish, purulent material which upon culture proved to contain streptococcus hemolyticus. Bronchopleural fistula was shown to be present by the introduction of methylene blue into the right chest and the subsequent expectoration of bluish sputum. Daily thoracentesis and both local and systemic penicillin and streptomycin were followed by a rapid clearing

of the empyema. This patient was discharged on his 16th hospital day after refusal of both thoracoplasty and oleothorax.

Three weeks later, he again returned, with evidence of empyema. At thoracentesis, 900 milliliters of greenish purulent material was removed from the pleural space. Daily thoracentesis, as well as local and systemic antibiotic therapy, was followed by rapid clearing of the empyema. Two weeks later, after injecting methylene blue into the right hemithorax without evidence of bronchopleural fistula, 50 milliliters of sterile olive oil was introduced into the pleural space and 500 milliliters of oil was added on the following day. Fluoroscopy and x-ray film showed the hemithorax to be filled and the patient was discharged. He did not return for follow-up as requested. His physician reported that he subsequently developed evidence of local and cerebral recurrence of carcinoma and expired seven months after pneumonectomy. No further empyema occurred.

Eight of the 12 cases in this group are still living two to 22 months following pneumonectomy. Four are apparently well and have returned to light work or to their original jobs. These patients have been followed at monthly intervals and show no evidence of recurrence of carcinoma or difficulty resulting from the presence of the oleothorax. Two of the eight patients have recently shown evidence of spread of the malignancy, one to the brain, and the other to the contralateral lung with complicating hydrothorax. The case report of the latter follows:

Case 3: H.D., a 55 year old white male was admitted July 27, 1949, with a diagnosis of bronchogenic carcinoma of the right lung. Pneumonectomy was done three days following admission. The pathological diagnosis was undifferentiated carcinoma of the bronchus with lymph node metastases. Four weeks following pneumonectomy he was readmitted for

FIGURE 4 FIGURE 5

Figure 4, Case 4: One year following pneumonectomy for bronchogenic carcinoma, an empyema and pleuro-cutaneous fistula developed.—*Figure 5, Case 4:* Oleothorax has been established.

oleothorax. After removal of 250 milliliters of serous fluid, 25 milliliters of sterile olive oil was instilled in the right pleural space. The following day 400 milliliters, and one day later 300 milliliters of sterile olive oil was placed in the hemithorax. X-ray film showed adequate filling and a small apical cushion of air. The mediastinum had returned to the midline. Two and one-half months later, an increased intrapleural pressure was noted on thoracentesis and 300 milliliters of serous fluid was removed from below the oleothorax. Within the next two months a total of 900 milliliters of fluid was removed on three occasions. A specimen of fluid and oil has been studied for evidence of bacteria or malignant cells. None could be found. Currently, 50 to 100 milliliters of fluid is removed from his chest each month. An x-ray film taken nine months following pneumonectomy showed the first evidence of extension of the malignancy to the remaining lung.

It is our impression that this patient has a hydrothorax as the result of pleural extension of the undifferentiated carcinoma. However, we are at the present time unable to eliminate the possibility that this might be a reaction to the presence of the olive oil.

In one case of this group, oleothorax has been discontinued and thoracoplasty performed.

Case 4: O.S., a 47 year old white male was admitted August 10, 1948, with a tentative diagnosis of bronchogenic carcinoma and a right pneumonectomy was performed 15 days later. The pathological diagnosis was squamous cell carcinoma of the bronchus with lymph node metastases. One year following surgery this patient developed a right empyema and a pleurocutaneous fistula (Figure 4). This responded to local aspiration combined with local and systemic antibiotic therapy. Three weeks after the appearance of the empyema the patient was referred to us for

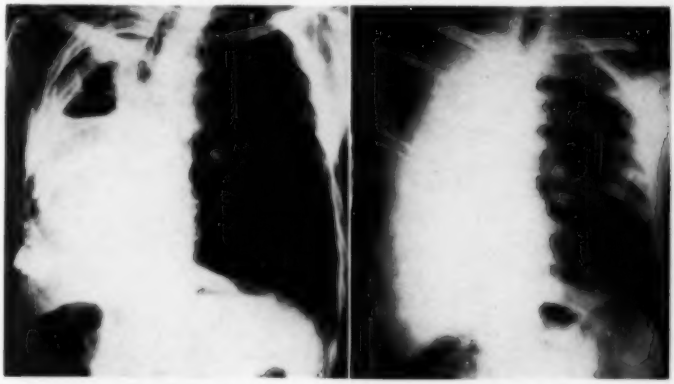

FIGURE 6 FIGURE 7

Figure 6, Case 4: Oleothorax complicated by recurrence of empyema and pleurocutaneous fistula. Lipiodol outlines the base of the empyema space.—*Figure 7, Case 4:* Early postoperative film showing thoracoplasty with satisfactory collapse of the pleural space.

oleothorax. The pleurocutaneous fistula was healed, and his temperature and white blood count had been normal for two weeks. X-ray examination showed the left lung to be slightly hyperaerated, and the heart and trachea to be shifted to the right. One hundred milliliters of clear fluid was removed from the pleural space and 25 milliliters of sterile olive oil introduced. On the following day, 225 milliliters of oil was instilled, and an x-ray film (Figure 5) revealed complete filling of the hemithorax and return of the mediastinum towards the midline.

Four months after establishment of the oleothorax, empyema again developed and there was a spontaneous drainage of oil and purulent material through the site of the healed pleurocutaneous fistula (Figure 6). Culture of the pleural fluid yielded Staphylococcus aureus. The empyema responded to treatment.

Two weeks later thoracoplasty was done with removal of the first to seventh ribs and a satisfactory collapse of the pleural space resulted (Figure 7).

Although this patient is included in this series of cases, it will be noted that the oleothorax was not established until one year after pneumonectomy and following development of empyema. This case does illustrate, however, that oleothorax is reversible and can be discontinued at any time in favor of a thoracoplasty.

In only one of the 20 patients in this series has empyema with bronchopleural fistula developed after the production of oleothorax. Inasmuch as this patient had been subjected to pneumonectomy for bronchogenic carcinoma, his case report is included in this group.

Case 5: H.G., a 58 year old white male entered the hospital April 11, 1949 and left pneumonectomy was done seven days later. Pathological diagnosis was squamous cell carcinoma with metastases to the regional lymph nodes. Two months following operation, he was readmitted com-

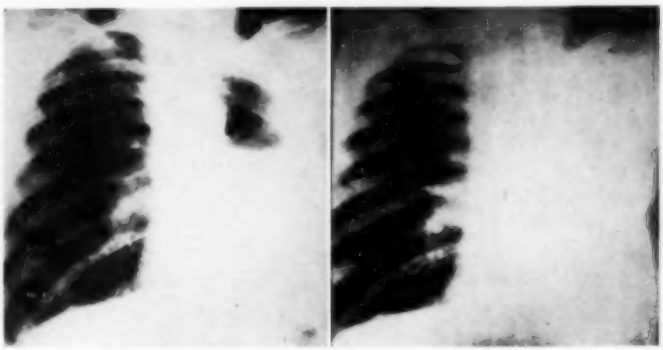

FIGURE 8 FIGURE 9

Figure 8, Case 5: X-ray film made two months postoperatively at time of admission with bronchopneumonia.—*Figure 9, Case 5:* Oleothorax has been established.

plaining of cough, chills, fever, and dyspnea of three days duration. A diagnosis of bronchopneumonia was made (Figure 8) and successfully treated with antibiotics. Inasmuch as bacteriological examination of the pleural fluid showed it to be sterile, oleothorax was instituted, using 400 milliliters of sterile olive oil, after the pneumonia had cleared. An x-ray film (Figure 9) taken at the time of discharge showed the pleural space to be filled except for a small apical cushion of air. The mediastinum had returned toward the midline.

Four weeks after establishment of the oleothorax this patient again noted cough and fever. Shortly thereafter he started producing foul sputum mixed with oil. According to previous instruction, he immediately went to bed and remained on his left side until he was brought to the hospital (Figure 10). Thoracentesis was done shortly after admission and 300 milliliters of purulent material was removed from the left pleural space. Bacteriological study revealed Escherichia Coli. The empyema rapidly cleared with treatment.

Thoracoplasty was refused by this patient and oleothorax was reinstituted two months following the empyema (Figure 11). Recently a bacteriological examination of a specimen of oil removed from his hemithorax showed no evidence of bacteria.

II) *Tuberculosis:*

Oleothorax has been used in six cases following pneumonectomy for tuberculosis. All patients in this group were females, ranging in age from three to 58 years. There have been no deaths.

The indications for oleothorax in this group have been refusal of thoracoplasty in three patients, contralateral disease in two, and age in one.

The three patients who refused thoracoplasty have been fol-

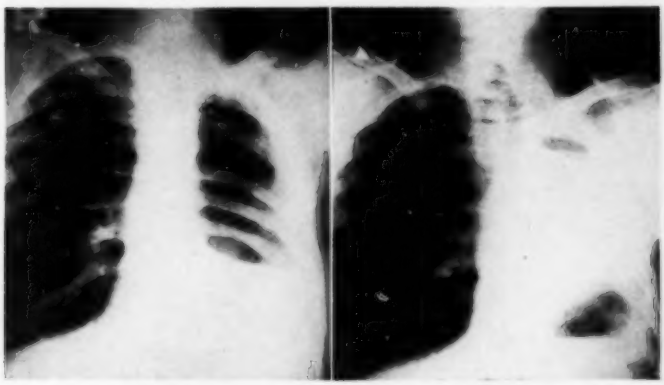

FIGURE 10 FIGURE 11

Figure 10, Case 5: Oleothorax complicated by empyema and bronchopleural fistula.—*Figure 11, Case 5:* Oleothorax has been reestablished following clearing of the empyema and spontaneous closure of the bronchopleural fistula.

lowed three, eight and 18 months following establishment of the oleothorax. There has been no evidence of complication or difficulty resulting from this procedure.

Age as an indication for oleothorax is illustrated in a child of three years who at operation was found to have tuberculous pneumonia and bronchiectasis, for which pneumonectomy was performed. Because of the presence of disease in the contralateral lung (Figure 12), and the inherent danger of spread in an overdistended lung, oleothorax was considered as a temporary measure in this child. One hundred eighty milliliters of sterile olive oil was introduced into the left hemithorax. There has been regression of the disease in the remaining lung (Figure 13).

Two adult cases in which there was extension of the tuberculosis to the contralateral lung are presented in detail:

Case 14: J.M., a 31 year old white female known to have tuberculosis since 1935 was admitted to a sanatorium on August 8, 1943. Despite pneumothorax, the sputum remained positive. Bronchoscopy and bronchography two years later showed a stenosis of the right main bronchus. Shortly thereafter pneumonectomy was performed and the postoperative course was complicated by tuberculous empyema. Because of this patient's poor general condition and evidence of tuberculous disease in the remaining lung, the empyema was treated by aspiration of the pleural fluid and introduction of olive oil containing 3 per cent Gomenol. Oleothorax has been continued although this patient is no longer under our supervision. In September, 1947, there was recurrence of the disease in the remaining lung which has responded to bed rest and streptomycin

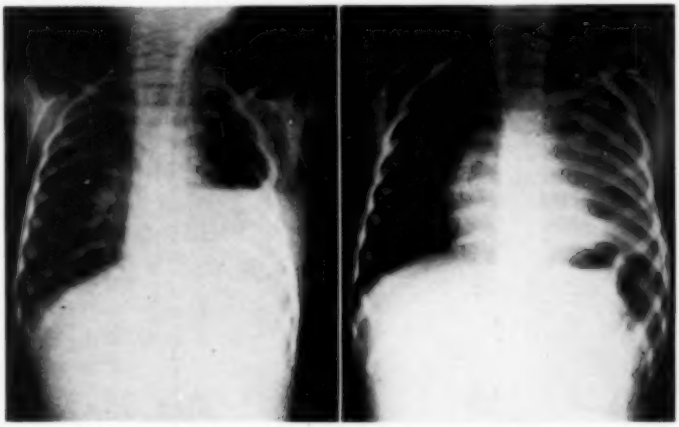

FIGURE 12 FIGURE 13

Figure 12, Case 13: Postoperative film of a three year old child showing a tuberculous lesion in the remaining lung.—*Figure 13, Case 13:* Following oleothorax, there has been regression of the lesion in the right lung.

therapy. The patient has now returned to limited activity. The oleothorax has been present for six years without complication.

Case 15: J.C., a 32 year old white female entered the hospital December 17, 1948. During the preceding seven years, pneumothorax had been maintained for a moderately advanced tuberculous lesion of the left lung. X-ray film taken at the time of admission showed evidence of hydropneumothorax. By bronchoscopy, partial stenosis of the trachea and complete stenosis of the left main bronchus was demonstrated. Following repeated tracheal dilatations, pneumonectomy was performed one month after hospitalization. An x-ray film taken four weeks postoperatively showed mediastinal shift to the left and two nodular lesions in the right hilus which were interpreted as new tuberculous foci. Because of this complication, oleothorax was established by the introduction of 300 milliliters of sterile olive oil into the left pleural space. Roentgenograms (Figure 14) showed the mediastinum to have returned to the midline. One year after establishment of the oleothorax, an x-ray film (Figure 15) showed evidence of fibrous healing of the lesions in the right hilus. The oleothorax has been augmented by small amounts of additional oil when indicated by negative pleural pressure.

III. *Other Lesions Requiring Pneumonectomy:*

Only two patients with lesions other than bronchogenic carcinoma or tuberculosis have been given oleothorax. In both cases, thoracoplasty was refused. One, a 22 year old white female was found to have a bronchial adenoma of the left main bronchus for which the left lung was resected in January, 1949. Oleothorax was established five weeks later. During an 18 months period of

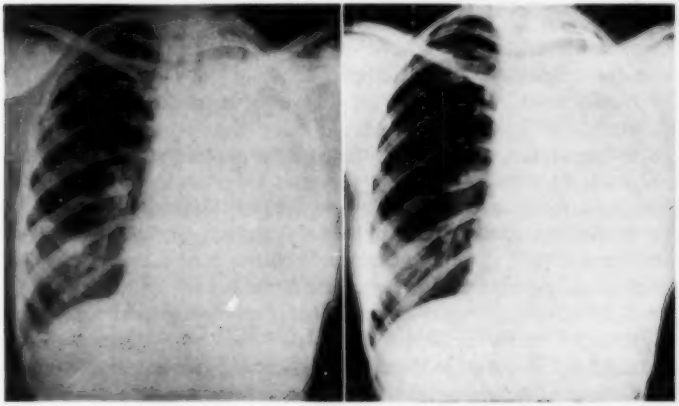

FIGURE 14 FIGURE 15

Figure 14, Case 15: Oleothorax has been established because of the presence of new tuberculous foci in the remaining lung.—*Figure 15, Case 15:* X-ray film one year following institution of oleothorax, shows improvement of the tuberculous lesions.

observation, neither evidence of recurrence of the adenoma nor difficulty from the oleothorax has occurred. The patient has subsequently completed an uncomplicated pregnancy.

The second patient in this group developed empyema following pneumonectomy. This case is reported in detail.

Case 20: V.J., a 31 year old white female had a pneumonectomy for an infected congenital cystic disease of the left lung on November 6, 1948. Three weeks following surgery she noted the onset of cough and fever, and began producing foul brownish sputum. After admission to the hospital, 1,100 milliliters of green, purulent material was obtained by thoracentesis, which upon culture showed Streptococcus hemolyticus. By the intrapleural injection of methylene blue, the presence of a bronchopleural fistula was demonstrated. Treatment consisted of daily thoracentesis combined with local and systemic antibiotic therapy. After 10 days, and improvement in the clinical condition of the patient, one milliliter of methylene blue and 25 milliliters of sterile olive oil were introduced into the left pleural space. Inasmuch as no methylene blue appeared in the sputum and examination of the pleural fluid by smear showed no bacteria, 800 milliliters of sterile olive oil was placed in the hemithorax during the next two days. During the succeeding 18 months, no evidence of empyema or bronchopleural fistula have occurred. A recent suggestion that the oleothorax be replaced by thoracoplasty has been refused because of the patient's desire to remarry and the fear that such an operation might interfere with this objective.

Bacteriological Investigation

Since infection with resultant empyema, bronchopleural or pleurocutaneous fistulae is a hazard either before or after oleothorax, the patients included in this study were requested to return in February and March, 1950, so that a bacteriological study could be made of samples of oil removed from the pleural space. After an x-ray inspection of the chest, 50 cc. of oil was removed from the hemithorax. Eleven of the 16 patients still alive were able to return.

Because of the difficulties of separation and culture of organisms from oil, a modification of the method of extraction of microorganisms from this material reported by Stevens[7] was used for this study. An extracting fluid was prepared by adding 0.05 per cent Tween "80" (polyoxyethylene sorbitan monooleate) to physiological saline which had been buffered to pH 7.4 with KH_2PO_4 and Na_2HPO_4. Thirty milliliters of the extracting fluid was placed in an eight ounce prescription bottle, plugged with cotton and sterilized at 121 degrees C. under 15 pounds pressure for 20 minutes. To this was added 10 milliliters of the oil which had been removed from the pleural space. The cotton plug was replaced with a sterile serum bottle cap and the bottle shaken at 25 degrees C. on a mechanical shaker for 30 minutes. The bottle was then inverted and allowed to stand for four hours at 4 degrees C. By means of

sterile needle and syringe, one milliliter of the aqueous layer was withdrawn and inoculated into thioglycollate tubes. Any sample showing growth in five days was streaked on either aerobic or anaerobic blood agar plates, depending upon the area of growth in the thioglycollate media. Isolated colonies were then used for identification.

Prior to the use of this method of extraction upon the clinical material, it was tested upon two representative organisms, Bacillus subtilis and Streptococcus hemolyticus. Although there was evidence of some attenuation of the growth of these bacteria after being placed in sterile oil, recovery of the organisms could be satisfactorily demonstrated upon the thioglycollate media.

Moreover, since penicillin in oil was added to the olive oil prior to instillation in the pleural cavity, a penicillin assay was done on the sample of oil removed from the hemithorax. Since penicillin is much more soluble in water than in olive oil, five milliliters of oil was shaken for 15 minutes with an equal amount of sterile physiological saline. The filter paper disc method of penicillin assay described by Epstein, Foley, Perrine and Lee[6] was used. The concentration of penicillin in the sample was calculated from the size of the zone of inhibition of the test organism against previously prepared standards with known concentrations of a water solution of penicillin. The following factors, together with volume of dose and size of disc, were held as constant as possible:

Organism—Staphylococcus aureus (209-FDA). Plates were seeded with 1 cc. of a 1:1000 dilution of an 18 hour trytose broth culture of the test organism.

Media—14 cc. blood agar base (Difco).

Incubation—Time and temperature, 18 hours at 37 degrees C.

Control—Water solution of penicillin "G".

Seven cases of Group I (bronchogenic carcinoma) are included in the bacteriological study. Five of these seven cases showed no bacteria in the specimen of oil removed for study. Included is Case 5 (H.G.) who has received a second oleothorax after developing an empyema and bronchopleural fistula as a complication of his first oleothorax.

Staphylococcus aureus was found in one patient (Case 6, J.H.) who has had no clinical evidence of infection at any time following pneumonectomy.

Staphylococcus aureus was found also in Case 4 (O.S.). This patient, who has been reported in detail above, had a Staphylococcus empyema with pleurocutaneous fistula one year following pneumonectomy and again after establishment of the oleothorax. The specimen submitted for study was obtained on the third day of treatment for the second empyema. In this specimen only could

the presence of penicillin be detected. Twenty units per milliliter of pleural fluid was the calculated concentration.

Two patients of Group II (tuberculosis) returned for this study. Both specimens were negative for pyogenic and acid fast bacteria. Penicillin could not be demonstrated in the oil removed.

Both patients of Group III returned. Case 20 (V.J.), who had empyema prior to her oleothorax, showed no evidence of bacteria in the oil removed. Corynebacterium diphtheria was isolated from the oil of Case 19 (J.G.) who had bronchial adenoma. However, these organisms were considered avirulent after study by the Frazier test.

Discussion

Following pneumonectomy, thoracoplasty is probably the best method for collapse of the remaining pleural space. In some cases, however, a method of obliterating the empty hemithorax which is less traumatic than thoracoplasty should be considered. In our hands, oleothorax with sterile olive oil containing penicillin in oil has proved useful for this purpose.

Olive oil has been chosen because of our familiarity with this agent in the past. Other agents such as mineral oil which are not as readily absorbed could easily be substituted. Oil as a pleural prosthesis has definite advantages over solid agents in that it is readily available and easily sterilized. By virtue of its fluidity it is easily introduced into the thorax and can conform to the size and shape of any cavity.

Oleothorax should be deferred for four to six weeks following pneumonectomy, because in our experience empyema and bronchopleural fistula will have developed in most instances within that time.

Oleothorax following pneumonectomy has its greatest application in cases of bronchogenic carcinoma. In those cases in which a palliative pneumonectomy has been done, oleothorax is easily instituted with little distress to the patient. Patients who refuse thoracoplasty will usually accept oleothorax as a substitute.

Since children tolerate pneumonectomy well, oleothorax is rarely indicated. However, if tuberculosis is present in the remaining lung, this procedure may be used as a temporary measure during the period of growth.

In the adult with tuberculosis, this procedure is most applicable in those patients in whom thoracoplasty might prove fatal. It might also be considered in cases of tuberculous empyema following pneumonectomy as a temporary measure while the patient is being prepared for thoracoplasty as well as in those cases who refuse additional surgery.

The use of oleothorax has been avoided by many because of the possible occurrence of empyema, bronchopleural and pleurocutaneous fistulae. Of the 20 cases of this series, four had empyema prior to the establishment of the oleothorax. In two cases this was due to staphylococci, in one to tuberculosis, and in one to streptococci. In only one case did the empyema recur following the establishment of oleothorax. In this man (Case 4) a pleurocutaneous fistula had been present at the time of the original empyema and might have been the source of the reinfection. Moreover, this oleothorax was started over one year following pneumonectomy.

In only one case did empyema with bronchopleural fistula develop after oleothorax. Analysis of this case reveals that he had been treated for bronchopneumonia only a few days prior to the establishment of oleothorax. In retrospect, although the pleural fluid was sterile at the time of starting the oleothorax, it would have been wiser to have delayed this procedure.

SUMMARY

1) Oleothorax with sterile olive oil containing penicillin in oil has been used in 20 selected cases.

2) Empyema developed in two cases following oleothorax and was associated in one with bronchopleural fistula and in the other with pleurocutaneous fistula.

3) Oleothorax is reversible and thoracoplasty can be substituted at any time.

4) Hydrothorax occurred in one case as a complication to oleothorax in a patient suspected to have pleural recurrence of bronchogenic carcinoma.

5) Empyema present after pneumonectomy does not contraindicate oleothorax if the empyema cavity is adequately sterilized.

RESUMEN

1) En 20 casos seleccionados se ha empleado el oleotórax con aceite de oliva estéril que contiene penicilina en aceite.

2) Apareció empiema en dos casos después del oleotórax y estuvo asociado en uno con fístula broncopleural y en el otro con fístula pleurocutánea.

3) El oleotórax es reversible y puede substituirse una toracoplastía en cualquier tiempo.

4) Ocurrió hidrotórax como complicación del oleotórax en un paciente que se sospechaba tener una recidiva pleural de carcinoma broncógeno.

5) El empiema subsiguiente a una neumonectomía no contraindica el oleotórax si se esteriliza adecuadamente la cavidad del empiema.

RESUME

1) Les auteurs ont utilisé dans 20 cas choisis l'oléothorax avec une huile stérile mélangée à de la pénicilline.

2) Dans deux cas, à la suite de l'oléothorax, survint une pleurésie purulente; une fois, elle s'accompagnait d'une fistule bronchopleurale, et une autre fois d'une fistule pleuro-cutanée.

3) L'oléothorax peut être cessé, on peut lui substituer quand on veut une thoracoplastie.

4) Dans un cas l'oléothorax se compliqua d'un hydrothorax. Il s'agissait d'un malade qui paraissait avoir une métastase pleurale d'un cancer bronchique.

5) Une pleurésie purulente survenant après pneumonectomie ne contre-indique pas l'oléothorax, si la cavité pleurale est convenablement stérilisée.

REFERENCES

1 Johnson, J., Kirby, C. K., Lazatin, C. S. and Cocke, J. A.: "The Use of a Prosthesis to Prevent Overdistention of the Remaining Lung Following Pneumonectomy," *Surgery*, 22:179, 1947.

2 Johnson, J., Kirby, C. K., Lazatin, C. S. and Cocke, J. A.: "The Clinical Use of a Prosthesis to Prevent Overdistention of the Remaining Lung Following Pneumonectomy," *J. Thoracic Surg.*, 18:164, 1949.

3 Small, J. T., Clagett, O. T. and Grindlay, J. H.: "Additional Use of Gelatin Foam in Thoracic Surgery: Preliminary Report," *Proc. Staff Meet., Mayo Clinic*, 22:585, 1947.

4 Grindlay, J. H., Clagett, O. T. and Rydell, J. R.: "Permanent Filling of Dead Space in the Pleural Cavity After Pneumonectomy," *J. Thoracic Surg.*, 19:391, 1950.

5 Cournand, A. and Berry, F. B.: "The Effect of Pneumonectomy Upon Cardiopulmonary Function in Adult Patients," *Ann. Surg.*, 116:532, 1942.

6 Overholt, R. H. and Langer, L.: "The Technique of Pulmonary Resection," First Edition, Charles C. Thomas, Springfield, Illinois, 1949.

7 Stevens, F. A.: "The Bactericidal and Photochemical Properties of Irradiated Cod Liver Oil and an Ozonide of Olive Oil," *J. Bacteriology*, 32:47, 1936.

8 Epstein, J. A., Foley, E. J., Perrine, I. and Lee, S. W.: "Convenient Assay Method for Penicillin and Similar Substances," *J. Lab. and Clinical Med.*, 29:319, 1944.

Discussion

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As stated by Dr. Andrews, thoracoplasty is still the method of choice for the prevention of mediastinal shift, over distension of the remaining lung and the resultant disturbances in cardiorespiratory function which may follow pneumonectomy in the adult. It is a simple, permanent procedure which carries a low risk and has the advantage of obliterating the pleural cavity.

It is my opinion that thoracoplasty should be done following most pneumonectomies for inflammatory disease particularly in

the younger age groups of adult patients. This is especially true in patients having a pneumonectomy for tuberculosis, where the obliteration of the pleural space and the protection of the remaining lung are so important. In patients having a pneumonectomy for other lesions as neoplasm, who are in the younger age group, and who are considered to have a good prognosis, I believe thoracoplasty to be advisable.

There, of course, is a natural reluctance on the part of both the patient and the surgeon to submit to or perform a second major operation soon after a pneumonectomy. That is only a natural human reaction. However, if the surgeon evaluates the situation carefully preoperatively, and if in his best judgment he considers a thoracoplasty advisable, he should inform the patient of this fact as part of the surgical attack on his disease. If the patient is prepared for a thoracoplasty from the outset, as a necessary part of his treatment, it has been my experience that he is much less likely to refuse it. In certain instances a partial thoracoplasty may be done at the time of the pneumonectomy.

There remains a group of patients in whom a postpneumonectomy thoracoplasty is inadvisable because of age or debility, poor pulmonary function, or poor prognosis in which a simpler method of controlling the intrathoracic pressures and mediastinal position is desirable. It is in this group that some means of space filling prosthesis is particularly desirable. Ideally, some form of prosthesis is needed which could be utilized at the time of pneumonectomy, which is non-irritating, which is malleable and can be easily shaped to conform with size, volume and shape, and which can be easily removed if necessary. However, most of us are reluctant to use foreign bodies in the chest because of the hazards of infection, pressure on vital structures and bronchial fistulae. It would seem to me that this paper presented here today gives us the closest approach to our ideal which we have today. I have had no experience with the use of oleothorax following pneumonectomy but do recall several patients in whom it might have been applied. Oil does meet the requirements of a pleural prosthesis in that it is pliable, conforms easily to size and shape, cannot compress vital structures and can be easily evacuated if the necessity arises. Its introduction four to six weeks after the pneumonectomy would seem safe in most instances from the standpoint of the possibility of a bronchial fistula. However, following pneumonectomies for tuberculosis, the bronchus may open at a still later date, secondary to pleural infection. Because of this possibility, it would seem wise to do a postpneumonectomy thoracoplasty soon in this group, rather than use oleothorax.

Artificial Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis

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Since the pioneer efforts of Banyai[6] there have emerged only a few reports up to relative recency. Since 1947 publications by Mitchell et al.,[1] Trimble et al.,[8] Hurst et al.[14] and several others have contributed notably to further clarification of the results which have been consistently good, particularly in the face of many instances of far advanced disease wherein prognosis once was held as being hopeless.

The dilemna of having to tell a patient "nothing can be done" is partially solved through the use of pneumoperitoneum. Though so much remains yet to be done, it cannot be denied that artificial pneumoperitoneum offers new hope to many, either by itself or preparatory to surgery. Yet as many enthusiasts as there are, there are some who doubt its efficacy and rightful place in the treatment of pulmonary tuberculosis, except in a few rigidly select cases. In our experience it has proved useful and often life-saving in a rather wide variety of cases to which other forms of collapse were not readily adaptable.

Mitchell and his co-workers[1] conducted an exhaustive survey of the literature from 1937 to 1945 and found that those men who had employed artificial pneumoperitoneum in a large series obtained favorable results. In the smaller group of unfavorable reports it was noted that the largest single group of cases studied was only 50 cases. The largest number of cases in a single report were published by Crow and his co-workers.[9] Of 546 cases they obtained good results in 60 per cent with the period of observation ranging up to five years.

The authors have reviewed the literature in the past three years (1946-1948) and have found several noteworthy contributions. In 1946 Aslett and Jarman[18] reported favorable results in 42 cases, the majority of which were far advanced. During this same year Banyai's[6] monumental work on pneumoperitoneum was published.

In 1947 Mitchell et al.[1] published their notable paper. They received satisfactory results in 57 per cent of white and 37 per cent of colored patients with advanced pulmonary tuberculosis not amenable to conventional forms of collapse therapy. Hurst and his co-workers[14] reported results on 103 cases in which phrenic crush was an adjunct to the pneumoperitoneum. Gilmore[7] found

that with the use of pneumoperitoneum eight of nine cases previously considered for thoracoplasty were spared this measure.

In 1948 the noteworthy work of Trimble[8] and his associates appeared. In a study of 407 cases 57 per cent were arrested and an additional 13 per cent definitely improved. During this same year Anderson[10] wrote an excellent monograph on the rationale of pneumoperitoneum. Calix and Jacobs[5] strongly advised the use of phrenic crush along with pneumoperitoneum. Keers[4] reviewed 74 cases and reported favorable results. He advocated use of phrenic crush as an adjunct also, but in some cases obtained good results with the use of pneumoperitoneum alone.

Rationale of Mechanism

As with the other established methods of treatment, the purpose of artificial pneumoperitoneum is to place the diseased lung, or lungs, at rest. This is the result of mechanical interference with the normal anatomical and physiological status of the respiratory elements and is accomplished (1) by reduction of lung volume and (2) by limitation of motion of the diaphragm. The resultant relaxation of the lungs promotes changes within their functional sphere which are believed to be essential for healing; viz, closure of cavities, lymph stastis, reduction of the minute volume of blood (inducing relative tissue anoxemia), reducing spread (bronchogenous, lymphogenous and hematogenous), diminishing toxin absorption and accumulation of carbon dioxide.

The peritoneal space is essentially a closed space. In the upper abdominal cavity there is a negative pressure, transmitted to some extent by the more rigid compartment of the thorax. Upon the introduction of air into the peritoneal space, there is a reversal of the transmission of pressures, resulting in collapse of lung tissue. The collapse, as when air is directly introduced into the thorax, is enhanced by the change in physical quality of diseased lung tissue, thus in a measure resulting in some degree of selective collapse. Anderson[10] has found that although there is immediate change in intrapleural pressure, there is a return to normal despite the fact that the lungs are reduced in volume. Therefore, the lungs remain in almost normally functioning physiological state. The necessity for presence of pleural integrity is obvious as is the same for diaphragmatic integrity. The action is mechanical, thus mechanical interference from adhesions and the like would reduce efficiency of pneumoperitoneum. However, despite these experimental observations and hypothetical premises, it has been our experience, as with others, that in the face of pleural thickening and adhesions, satisfactory collapse can still be achieved in many cases.

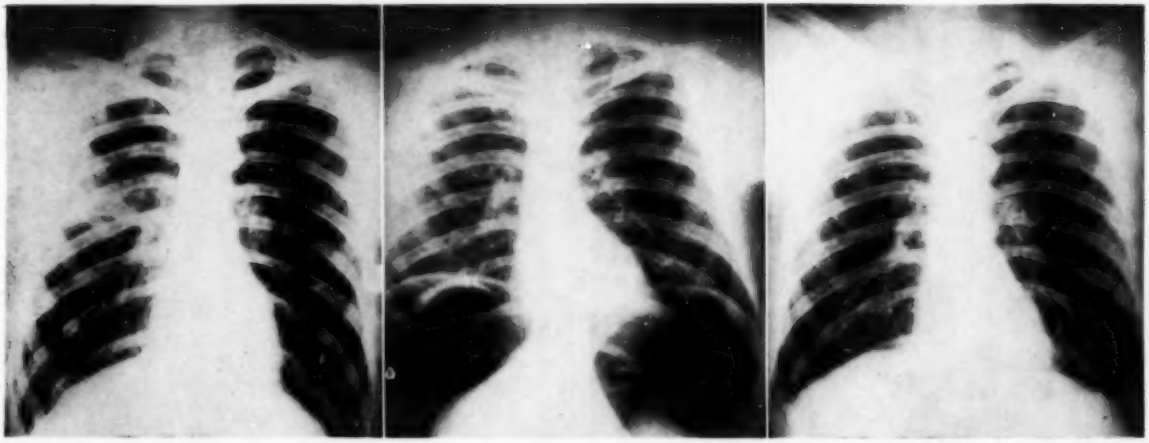

FIGURE 1a FIGURE 1b FIGURE 1c

Figure 1a: W.H., white male, 36 years old. Initial chest film showing pathology — moderately advanced with small cavitation. Sputum positive.—Figure 1b: Film of chest after 15 months of pneumoperitoneum. Note marked clearing of lesions. Sputum negative. Condition good.—*Figure 1c:* Pneumoperitoneum discontinued after 34 months. Follow-up film 26 months later shows only pleural thickening in upper lobe. Working full time. Condition excellent.

Again from the standpoint of theory, apical lesions should be healed just as well as basal lesions. This, however, has not been our experience with regard to closure of cavities in the apex, particularly if the wall of the cavity is thick. Hilar cavities and infiltrations are more difficult to heal because of the relative rigidity in the face of bronchi and the larger blood vessels.

Phrenic nerve crush as an essential and valuable adjunct was emphasized by Gilmore[7] and Hurst and his co-workers.[14] They feel that without this no collapse can be effective. However, Trimble[8] and Howlett[2] and others do not regard this as absolutely essential in all cases. We are in accord with the latter authors. In cases of bilateral far advanced disease, except in a few selected instances, phrenic crush is contraindicated. The ideal situation is in unilateral disease. The dangers of permanent diaphragm impairment must always be held in mind. With pneumoperitoneum alone, fluoroscopic examinations reveal definite limitation in motion of the diaphragm during quiet respiration. However, on deep inspiration, the motion can be normal.

The use of abdominal binders is recommended by many on the theory that the level of the diaphragm is elevated to a slightly higher level. Most of the patients in our series used abdominal binders but the authors feel that in the long run of evaluation it may not be necessary.

The vital capacity is reduced up to 12 per cent as found by Banyal[6] and Bennett.[19] Anderson[10] has recorded even greater re-

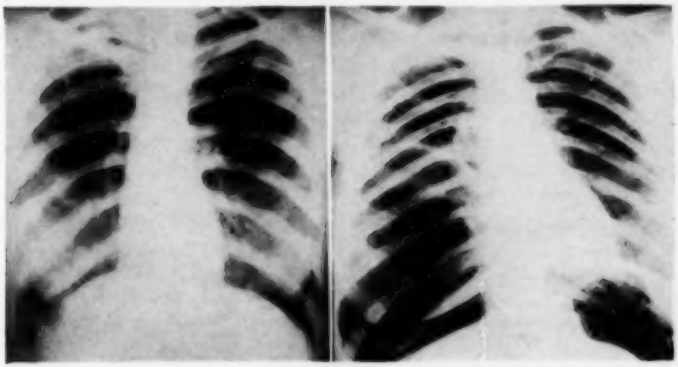

FIGURE 2a FIGURE 2b

Figure 2a: H.W., white female, 34 years old. Initial chest film showing pathology—moderately advanced with cavitation.—*Figure 2b:* Film of chest after 28 months of pneumoperitoneum. Right phrenic crush after PNP started. Good selective collapse. Note clearing of lesions and closure of cavity. Sputum negative. Condition good.

ductions. In the authors' observations the reduction in vital capacity has been somewhat less, nearer 10 per cent.

Pneumoperitoneum is indicated in any case of pulmonary tuberculosis not obviously hopeless in which there are no contraindications and in which no other form of collapse is preferable.

Pneumoperitoneum is contraindicated in cases with serious heart disease with low cardiac reserve and in cases with abdominal hernia or hernias which cannot be satisfactorily controlled by truss. Satisfactory pneumoperitoneum may not be possible in cases having dense peritoneal and/or pleural adhesions.

Method

The patient lies supine on the table. The site selected for the initial injection of air usually is 3 cm. to the left and 2 cm. above the umbilicus. The area is prepped with 70 per cent alcohol and draped. Using a 2 cc. syringe and a standard No. 25 gauge three-fourth inch hypodermic needle 2 per cent novocaine is injected intradermally. The smaller needle is replaced with one of equal bore but one and one-half inches in length and the anesthetizing is carried to and through the peritoneum. Then a No. 18 or 19 gauge needle one and one-half to two inches in length attached to the same 2 cc. syringe is placed through the anesthetized area. It can usually be felt by the guiding hand when this needle passes

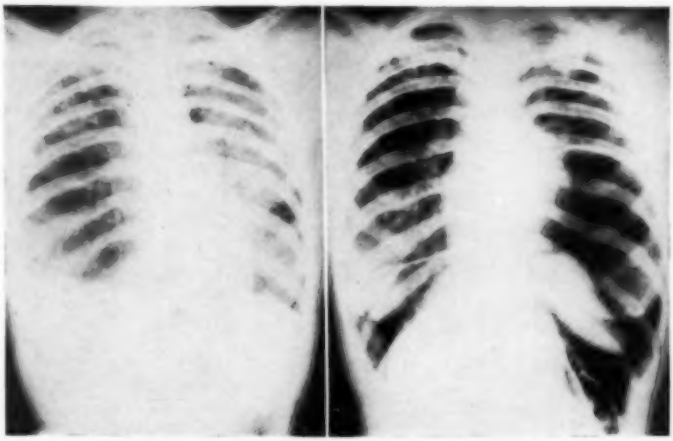

FIGURE 3a FIGURE 3b

Figure 3a: L.R., Negro female, 26 years old. Initial chest film showing far advanced tuberculosis with cavitation. Sputum positive.—*Figure 3b:* Film of chest after 34 months of pneumoperitoneum and phrenic crush showing marked improvement. Sputum negative.

through the peritoneum. Traction is applied to the plunger to determine that the point of the needle is not within a viscus or a blood vessel. Two cc. of air is injected slowly without pressure and a reading with water manometer taken. If the reading is not high, 100 cc. of air is given under low pressure and the manometer reading repeated. If the reading is not high and oscillations satisfactory, an initial dose of 350 to 500 cc. of air is given. No pain or discomfiture occurs during the administration, unless the needle is not in the cavity properly or the needle is pierced into an adhesive band. The authors have never experienced any complication with viscus perforation. After the patient sits up, he usually experiences some pain in the shoulders and neck, the result of the air collecting beneath the diaphragm.

Thereafter, novocaine or any other anesthetic is never used but with a swift single motion the needle is quickly introduced with little disturbance to the patient. The important advantage in discontinuing novocaine after the initial injection of air lies in the fact that there is no unnecessary delay with exchange of needles. This tends to allay apprehension. All of our patients prefer subsequent injections without novocaine. Occasionally, there is a small amount of bleeding but this is easily controlled with pressure. Occasionally, an adhesive band is pierced and another attempt is made elsewhere. Also now and then a patient presents an anterior abdominal wall which is unusually thick and herein a longer needle is employed.

The usual dosage of air is 750 to 1,000 cc. Rarely is more given. Weekly fluoroscopic examinations have enabled the authors to standardize the amount to these figures and maintain optimum collapse. These frequent examinations maintain a check on the progress and the morale of the patient. A patient may be permitted to skip a refill if the degree of elevation of the diaphragm warrants, but *all* patients are checked *weekly*.

Naturally, the primary treatment remains bed rest. This and the other important routines of diet, laboratory check, psychological and occupational therapy are maintained regularly. The time at which the patient becomes ambulatory depends upon the original pathology and clinical status and the progress of the individual. However, ambulatory pneumoperitoneum is begun as early as feasible.

Case Material

This report is based on clinical studies made on 70 consecutive cases. Of this number 17 have been discontinued, 14 voluntarily and three against medical advice. Fifty-three are still taking treatment. The age ranges from 19 to 63 years, the most frequent

PATIENTS IN WHOM PNEUMOPERITONEUM WAS COMPLETED OR DISCONTINUED

No.	Age	Sex	Race	Pathology (X-ray)	Sputum: Admission	Sputum: During PP	Sputum: Post PP	Phrenic Operation	Duration of PP (mos.)	Duration since last refill (mos.)	Comment
1	35	M	W	Moderately advanced, lt.	Neg.	Neg.	Neg.	Left	42	12	Satisfactory
2	43	M	W	Far advanced, bilateral	Pos.	Neg.	Neg.	No	53	4	Satisfactory
3	36	F	W	Moderately advanced, RUL	Pos.	Neg.	Neg.	Right	48	5	Satisfactory
4	35	M	W	Far advanced, bilateral, with cavitation	Pos.	Neg.	Neg.	Right	44	14	Satisfactory
5	36	M	W	Moderately advanced, rt. UL, with cavitation	Pos.	Neg.	Neg.	No	34	26	Satisfactory
6	63	F	W	Far advanced, left	Pos.	Neg.	Neg.	Right	42	14	Once considered hopeless. Now satisfactory
7	31	F	W	Minimal, lt.	Neg.	Neg.	Neg.	No	12	Irreg.	Discontinued against advice. Tbc. has recurred
8	22	F	W	Minimal, rt.	Neg.	Neg.	Neg.	No	36	12	Satisfactory

No.	Age	Sex	Race	Pathology (X-ray)	SPUTUM			Phrenic Operation	Duration of PP (mos.)	Duration since last refill (mos.)	Comment
					Admission	During PP	Post PP				
9	33	F	N	Far advanced, bilateral, with cavitation	Pos.	Pos.	Pos.	Right	4		Discontinued because of pressure cavity
10	34	M	W	Far advanced, bilateral	Pos.	Pos.	Pos.	No	3		Discontinued against advice. Dead
11	34	M	N	Far advanced, bilateral, with cavitation	Pos.	Pos.	Pos.	No	3		Discontinued because of hemorrhage. Dead
12	44	M	W	Far advanced, bilateral	Pos.	Pos.	Pos.	No	3		Discontinued against advice. Dead
13	40	M	W	Far advanced, bilateral, with cavitation	Pos.	Pos.	Pos.	No	13		Considered hopeless. Died during PP
14	22	F	N	Moderately advanced, bilateral	Pos.	Pos.	Pos.	Right	5	Left San.	Discontinued because of cardiac status
15	20	F	N	Moderately advanced bilateral with cavitation	Pos.	Neg.	Neg.	Right	46	10	Satisfactory
16	40	M	N	Far advanced, bilateral, with cavitation	Pos.	Neg.	Neg.	No	36	10	Satisfactory
17	28	F	N	Far advanced, bilateral, with cavitation	Pos.	Neg.	Neg.	No	36	16	Satisfactory

occurring in the second, third, and fourth decades. There were 26 males (37.1 per cent) and 44 females (62.1 per cent). Of the group that had completed treatment nine were females and eight were males. With regard to race incidence of the entire group, 40 were white (57.1 per cent) and 30 colored (42.9 per cent). Of those who had completed or discontinued treatment there were 11 white and six Negro.

Eight (11.4 per cent) of the entire group had minimal lesions, while 32 (45.7 per cent) had mderately advanced and 30 (42.9 per cent) had far advanced lesions. In the completed group there were two with minimal lesions, five with moderately advanced and 10 with far advanced. Ten of this group showed cavitation, four of which were multiple. Of the entire group 39 had cavities, 18 of which were multiple. The pathology incidence as to locale revealed a preponderance to be bilateral and, when unilateral, most often in the right lung. The disease was bilateral in 46

STATISTICAL SUMMARY

	No.
Age in years:	
10 to 20	1
20 to 30	24
30 to 40	27
40 to 50	16
50 to 60	1
60 to 70	1
Race:	
White	40
Negro	30
Sex:	
Male	26
Female	44
Pathology:	
Minimal	8
Moderately advanced	32
Far advanced	30
Total cavities	39
Locale Incidence:	
Right upper lobe	10
Right lung	7
Left upper lobe	4
Left lung	3
Bilateral	46
Phrenic nerve crush	27
Sputum:	
Positive	51
Negative	19

cases, in the right upper lobe in 10, the right lung in seven, the left upper lobe in four and the left lung in three. In the completed group 10 had bilateral disease, two each in the right lung, the right upper lobe and the left upper lobe and one in the left lung. Fifty-one had positive sputa and 19 were negative.

Results

As already stated the patients taking pneumoperitoneum are observed every week and those having been released as arrested or apparently cured have regular check-ups including x-ray inspection, cultures, etc. Those patients listed as being "satisfactory" include those who have shown good progress, including conversion of sputum, gain in weight, clearing of the disease as shown by x-ray, and general constitutional improvement. Those classified as being "improved" include the above criteria but have been observed for less than 12 months. Under the category listed as "unsatisfactory" include those whose lesions show either no clearing nor actual progression.

This discussion will be divided into two sections. The first is concerned with the 17 cases which have been either completed, discontinued voluntarily or discontinued against medical advice. In this group 10 patients qualified as being satisfactory. All are either on limited or on full activity. The percentage of success for the overall group is 58.8 per cent. Eliminating those who had terminated treatment against advice (three), the percentage becomes 71.4 per cent, and this is a more accurate figure. One of these had only minimal tuberculosis but has since developed further extension of the disease. This patient was observed for 12 months. The other two had treatment for only three months and are now dead. Pneumoperitoneum was discontinued in three others because of (1) failure to close pressure cavity, (2) hemorrhages, and (3) enlarged heart. These were observed for only 4.5 months. One other patient, who was considered hopeless, died during treatment. The 10 patients who completed treatment are well. The treatment completed was pneumoperitoneum from 34 to 53 months and further observation from four to 26 months. Thus, in evaluating results from the standpoint of completion of treatment, the results would be 100 per cent.

In the other group in which treatment is being continued, there are 53 patients. Of this number 47 (88.7 per cent) are considered satisfactory, three improved, and three unimproved. Of the three unimproved, one has had pneumoperitoneum for 37 months. Although the sputum has been consistently negative and the patient clinically is in good condition, the cavity has not been closed. In another there has been failure of cavity to close after six months.

Pneumoperitoneum has been discontinued and pneumothorax instituted. The last has had pneumoperitoneum for 60 months and the latest film showed what might possibly be extension although this is not definitely confirmed. The three patients are Negro, two female and one male.

The three patients in the improved group have been observed for less than 12 months but follow the criteria of those in the satisfactory group. In the latter, pneumoperitoneum has been administered between 12 and 84 months. The distribution as to time with regard to the varying degrees of lesions is demonstrated in an accompanying table. There were six patients with minimal lesions who have been taking pneumoperitoneum for an average of 32.5 months. There were 30 with moderately advanced lesions taking pneumoperitoneum for an average of 30.8 months, and, finally, there were 17 with far advanced tuberculosis with an average duration of observation of 24.2 months.

The results of the authors are compared with those of other workers in an accompanying table.

Complications

One of the strongest arguments in favor of wider use of pneumoperitoneum is the relatively rare occurrence of complications of a serious nature. In a total of 546 patients observed by Crow and Welchel[9] serious complication was encountered in only 5 (0.9 per cent). This was tuberculous peritonitis with ascites. One recovered and four died. Several deaths due to air embolism have been reported, but this is an exceedingly rare occurrence. Trimble and his co-workers[8] report that in 407 patients pneumoperitoneum was discontinued in 7 per cent because of severity of complications. They list the most common complications as follows: adhesive or obliterative peritonitis, nausea and pain, ascites, pelvic inflammatory disease, and cardiac embarrassment. They point out, further, certain untoward events may occur necessitating cessation of pneumoperitoneum rather than the actual complications themselves. In over 10,000 refills the authors occasionally encountered fluid in small amounts. None could be classed as peritonitis. No embolism occurred. Two cases were discontinued because of untoward events. One in a patient with an enlarged heart and the other because of uncontrollable pulmonary hemorrhage. None have been discontinued because of complications directly attributable to the pneumoperitoneum.

Addendum: Since this paper was written 17 of the 53 patients under treatment at the time have been expanded and are apparently healed.

SUMMARY

1) Pneumoperitoneum is a valuable adjunct in the therapy of tuberculosis and merits full consideration when decisions are being made as to the best form of therapy for any given case.

2) It can be used alone or with phrenicectomy or phrenic crush.

3) It is a relatively safe procedure and provides potential reserve in the event of recurrence after expansion.

4) In pneumoperitoneum, as in other forms of therapy the mental attitude of the patient is of prime importance and may even be one of the determining factors in the success or failure of treatment.

RESUMEN

1) El neumoperitoneo puede usarse solo o combinado con frenopraxis en el tratamiento de la tuberculosis pulmonar.

2) Es un procedimiento seguro y proporciona una reserva potencial en el caso de recaída después de reexpansión.

3) Puede usarse con sorprendente resultado en casos relativamente muy avanzados y aparentemente desesperados y será de utilidad cuando la deambulación pronta sea necesaria.

4) Es de valor en la preparación de casos para cirugía.

5) A menudo debe considerarse la terapéutica de elección como colapso para los casos con menos avanzada enfermedad con buenas probabilidades de recuperación, especialmente en aquellos en que las lesiones radican a medio pulmón o en los lóbulos inferiores.

RESUME

1) Le pneumopéritoine peut-être utilisé dans le traitement de la tuberculose pulmonaire soit isolément soit associé à l'écrasement du nerf phrénique.

2) C'est un procédé très sur et qui permet une réserve d'action dans l'hypothèse d'une rechute après expansion.

3) Il peut être utilisé avec des résultats surprenants dans le traitement de formes relativement très avancé et apparemment sans espoir. Il sera d'un grand secours quand on sera obligé de permettre au malade de se mobiliser précocemment.

4) Il est précieux pour préparer certains cas à une intervention chirurgicale.

5) Il peut souvent être considéré comme la collapsothérapie de choix chez les malades atteints de tuberculose moins grave et chez lesquels il y a espoir de guérison et alors plus spécialement dans les cas où la lésion siège dans les lobes inférieurs ou moyens.

REFERENCES

1 Mitchell, R. S. et al.: "Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis: Results in 710 Cases from 1937 to 1946," *Am. Rev. Tuberc.*, 55:306, 1947.

2 Howlett, K. S., Jr.: "Pneumoperitoneum," *Am. Rev. Tuberc.*, 58:134, 1948.
3 Anderson, N. L.: "The Rationale of Therapeutic Pneumoperitoneum. The Physiological and Mechanical Considerations," *Dis. of Chest*, 14: 732, 1948.
4 Keers, R. J.: "Pneumoperitoneum: Its Place in Treatment," *Brit. J. Tuberc.*, 42:58, 1948.
5 Calix, A. and Jacobs, S.: "Pneumoperitoneum," *Dis. of Chest*, 14:233, 1948.
6 Banyai, A. L.: "The Pneumoperitoneum Treatment," *C. V. Mosby Co.*, St. Louis, Missouri, 1946.
7 Gilmore, D. J.: "Pneumoperitoneum with Diaphragmatic Paralysis in the Treatment of Pulmonary Tuberculosis," *Dis. of Chest*, 13:153, 1947.
8 Trimble, H. G. et al.: "Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis: 407 Consecutive Cases," *Am. Rev. Tuberc.*, 57: 433, 1948.
9 Crow, H. E. and Whelchel, F. C.: "Diaphragmatic Paralysis and Pneumoperitoneum. Therapeutic Observations in White Patients," *Am. Rev. Tuberc.*, 52:367, 1945.
10 Anderson, N. L. and Winn, W. D.: "Pneumoperitoneum and Diaphragmatic Paralysis. Therapeutic Observations in 110 Negroes," *Am. Rev. Tuberc.*, 52:380, 1945.
11 Bailey, W. H.: "Air Embolism in Pneumoperitoneum. Report of a Fatal Case," *Am. Rev. Tuberc.*, 57:621, 1948.
12 Rilance, A. B. and Warring, F. C.: "Pneumoperitoneum Supplementing Phrenic Paralysis," *Am. Rev. Tuberc.*, 44:323, 1941.
13 Warring, F. R. and Thomas, R. M.: "Spontaneous Air Embolism," *Am. Rev. Tuberc.*, 42:682, 1940.
14 Hurst, A., Maier, H. M. and Dwork, R.: "A Critical Study of Pneumoperitoneum and Phrenic Nerve Crush in Pulmonary Tuberculosis," *Dis. of Chest*, 13:345, 1947.
15 Trimble, H. E. and Wardrip, B. H.: "Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis," *Am. Rev. Tuberc.*, 36:11, 1937.
16 Trimble, H. G.: "Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis," *Dis. of Chest*, 4:18, 1938.
17 Trimble, H. G., Eaton, J. L. and Moore, E.: "Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis," *Am. Rev. Tuberc.*, 39:528, 1939.
18 Aslett, E. and Jarman, T. F.: "Reaction After Pneumoperitoneum Treatment," *Lancet*, 1:304, 1946.
19 Bennet, E. S.: "Introduced Pneumoperitoneum in the Treatment of Pulmonary Tuberculosis," *Lancet*, 58:157, 1938.

Treatment of Unusual Pulmonary Amebic Abscess with Chloroquine*

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Pleuro-pulmonary amebiasis complicates amebic hepatic abscesses in about 15 per cent of the reported cases, as indicated by Ochsner and DeBakey[1] in their comprehensive review of the subject in 1936. The usual pulmonary complication consists either of a lower lobe abscess or a broncho-hepatic fistula, both of which arise by direct extension of an hepatic abscess through the diaphragm. Craig[2] states that "the lower right lobe of the lung is the site of the pulmonary amebic abscess almost invariably." Amebic empyema arises in 17 to 33 per cent of the reported cases. Primary amebic broncho-pulmonary involvement has been reported, but in these cases it cannot be said with certainty that amebic colitis was not present.

Ochsner and DeBakey[1] found that "hematogenous" pulmonary abscesses with independent liver abscesses occurred in 10.4 per cent of 153 cases collected from the literature and in none of their own 13 cases. Craig[2] refers to Girgis' two fatal cases of multiple pulmonary and hepatic amebic abscesses in which Endamoeba histolytica could be demonstrated in emboli in the pulmonary arterial vessels, thus supporting the view that hematogenous dissemination of the parasite may occur, presumably from the liver through the right side of the heart to the lung. In the absence of demonstrable contiguity between hepatic and pulmonary lesions, one must assume that this type of blood-borne dissemination may occur.

The following case report is of interest both because of the unusual location of the pulmonary lesion and the fact that Emetine alone failed to effect a clinical cure, while subsequent Chloroquine therapy caused a complete clearing of the pathological process.

The patient, M. E., a 54 year old white male painter, was admitted to the Dallas City-County Tuberculosis Sanitorium on October 13, 1949 for study of a prolonged pulmonary infection. He had been in good health until about four months prior to admission when, following a vacation at the seacoast, he began to note a cough productive of brownish material. His cough became steadily worse, and on one occasion he noted a

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transient pleuritic pain at the right costal margin. His other symptoms included anorexia, weakness, and malaise, but no chills or fever. Penicillin and sulfadiazine were administered without effect. A chest x-ray film taken after this therapy was interpreted as "possible virus pneumonia," and over the next 30 days he was given three courses of aureomycin with no remission of his symptoms. About three weeks before admission, following an episode of frank hemoptysis, he consulted a phthisiologist who recommended hospitalization at this institution, an infiltrative and cavitary lesion having been noted on the chest roentgenogram. A sputum examination was negative for acid-fast bacilli at that time. During the ensuing three weeks while he awaited admission, there were occasional temperature rises to 100 degrees F. and all his systemic symptoms continued. At the time of admission he had lost 15 pounds.

Past history revealed excellent previous health with no known exposure to tuberculosis. He had received adequate anti-luetic therapy 11 years before admission. Also 11 years prior to his admission a three year old daughter had died from dysentery of unknown type.

Physical examination revealed a temperature of 99 degrees F., pulse of 80, blood pressure of 140/90. He was well developed but showed signs of weight loss. The trachea was deviated slightly to the right. Examination of the chest failed to reveal any definite sign of intrapulmonary disease. The liver was palpable four centimeters below the right costal margin and was not tender. The remainder of the physical examination was not remarkable.

His initial laboratory studies showed a normal urinalysis, hemoglobin of 15.0 Gm./100 cc., hematocrit of 48. The white blood cell count was 13,800 with three band forms, 66 segmented forms, two eosinophiles, and 29 lymphocytes. The sputum was green and purulent and was negative for acid-fast bacilli on two smears and two concentrations. Blood urea, blood sugar, and serum proteins were normal. The sedimentation rate was 25 mm./hour. Cephalin-Cholesterol flocculation test was 2 plus in 48 hours, and 8 per cent of Bromsulfaphthalein was retained at 45 min-

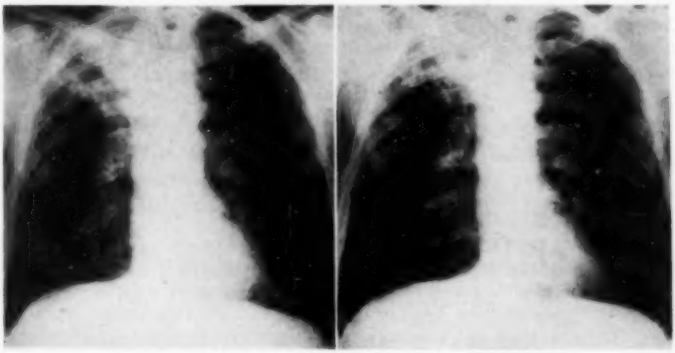

FIGURE 1 FIGURE 2

Figure 1: Appearance of the chest roentgenogram prior to therapy with Emetine.—*Figure 2:* Appearance of the chest roentgenogram at the completion of Emetine therapy.

utes. Chest roentgenogram revealed an infiltrative and cavernous lesion involving the right upper lobe (Figure 1). Tuberculin 1:1000 was negative and a routine sputum culture showed only normal flora.

During his first three weeks in the hospital he was afebrile and asymptomatic except for a cough productive of about one ounce of green purulent sputum daily. Bronchoscopy failed to reveal any evidence of bronchogenic carcinoma and the bronchial secretions aspirated at the time of bronchoscopy were negative both for tumor cells and acid-fast bacilli. On November 7, 1949, his temperature spiked to 102.4 degrees F., malaise and anorexia became marked, and concomitantly the liver became larger and quite tender. The white blood cell count rose to 22,000 with a slight left shift, and the sputum became rusty brown in color. The following day motile trophozoites of Endamoeba histolytica were found in the sputum. Stool examination were negative for amebae.

A course of Emetine, one grain daily for 10 days, was instituted with diminution in fever, but at the end of this time there was no appreciable change in his clinical symptoms (Figure 3). His sputum remained positive for trophozoites and the chest roentgenogram was unchanged (Figure 2). Because he had shown little improvement after Emetine, Aralen (Chloroquine) was started in doses of 1.0 Gram daily for two days followed by 0.5 Gram daily for 18 days. Procaine penicillin, 600,000 units daily, was also given to control possible secondary infection. By the end of one week after the institution of Chloroquine therapy, his cough was minimal and the sputum no longer rusty. It was after 10 days of Chloroquine therapy that the amebae disappeared from the sputum, and only at this time was there demonstrable roentgenographic improvement (Figure 4). He was then given a 10 day course of Carbarsone, and was discharged on December 19, 1949, to be followed as an out-patient. Chest

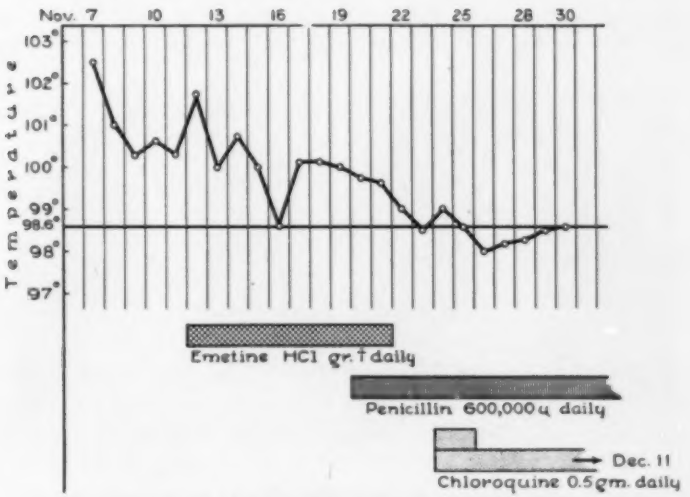

FIGURE 3: Chart demonstrating the patient's febrile course during period of therapy.

x-ray film at the time of discharge revealed marked clearing of the right apex with only questionable cavitation. The white blood cell count was normal and his cough had completely disappeared.

Subsequent roentgenograms as an out-patient have shown progressive clearing of the lesion until at present, six months after discharge, no signs of pulmonary disease are present (Figure 5). He is working actively and his weight has increased to its normal level.

Comments

The location of this patient's amebic abscess in the right upper lobe of the lung, and the striking resemblance to moderately advanced pulmonary tuberculosis delayed the correct diagnosis until almost three weeks after he first came under study, and it was only when fever, leukocytosis, the tender enlarged liver, and the rusty-brownish sputum appeared that the diagnosis was suspected and confirmed.

Of interest also is the fact that Emetine, which for years has been the only therapeutic agent of real value in cases of extra-intestinal amebiasis, failed to eradicate the parasites from the lung or to cause significant roentgenographic improvement in spite of a satisfactory febrile response. Consequently, it was decided to employ Aralen (Chloroquine) to effect full therapeusis.

Chloroquine, 7-chloro-4-(4-diethylamino-1-methylbutyl-amino) quinoline, one of the 4-aminoquinoline derivatives studied during recent years because of its anti-malarial activity, has shown increasing usefulness in the treatment of hepatic amebiasis.[3,4,5] It has been shown in studies in rats[6] that the tissue/plasma con-

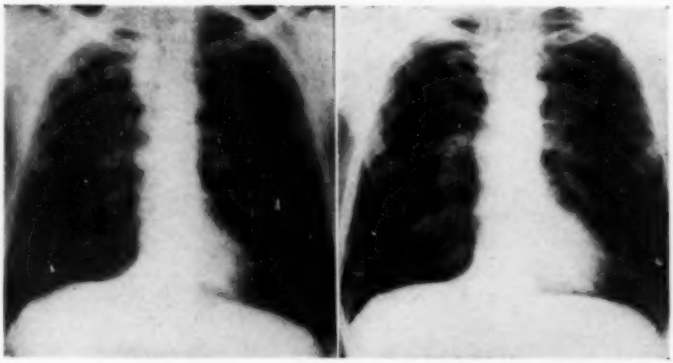

FIGURE 4 FIGURE 5

Figure 4: Appearance of the chest roentgenogram at the completion of therapy with Chloroquine.—*Figure 5:* Appearance of the chest roentgenogram seven months after completion of therapy.

centration of Chloroquine is 420 for liver and 640 for lung tissue. On the basis of these studies, then, it was felt that Chloroquine might be a useful agent in this case. Only after 7 to 10 days of Chloroquine therapy did roentgenographic improvement, disappearance of cough and accordingly disappearance of amebic trophozoites from the sputum, and improvement in systemic symptoms (increase in weight and appetite) occur. An interesting parallel may be drawn to Conan's eight cases of amebic liver abscess in three of which clinical response was noted only after Chloroquine therapy was instituted.[3] We used the dosage of Chloroquine suggested by Conan. The only toxic manifestations noted were transient nausea, vomiting, and numbness and tingling in the fingers. It was noted that the nausea and vomiting largely disappeared when the dose was diminished from 1.0 Gram to 0.5 Gram daily.

SUMMARY

A case of pulmonary amebic abscess of the right upper lobe with amebic hepatitis is reported in which hematogenous spread of the amebic parasites from liver to lung was the most probable pathogenetic likelihood. Since Emetine alone failed to cause a satisfactory response, and Chloroquine induced complete clinical remission, it is felt that Chloroquine is a useful agent in cases of pleuropulmonary amebiasis.

RESUMEN

Un caso de absceso pulmonar ambiano en el lóbulo superior derecho con hepatitis amibiana se refiere, en el que la diseminación hematógena de los parásitos ambianos del hígado fué la posibilidad patogénica más verosimil.

Cuando la emetina por si sola no dió resultado satisfactorio, la cloroquina obtuvo una remisión completa y por eso se cree que la cloroquina sea un agente útil en la amibiasis pleuro-pulmonar.

RESUME

Les auteurs rapportent une observation d'abcès amibien du poumon, localisé au lobe supérieur droit, etassocié à une hépatite amibienne. Ils pensent que la voie sanguine a été la plus vraisemblable pour expliquer le passage des amibes du foie au poumon. Etant donné que l'émétine à elle seule ne put amener une amélioration et que la chloroquine a permis une guérison clinique complète, les auteurs estiment que la chloroquine est un moyen thérapeutique utile dans les cas d'amibiase pleuro-pulmonaire.

REFERENCES

1 Ochsner, A. and DeBakey, M.: "Pleuropulmonary Complications of Amebiasis," *J. Thoracic Surg.*, 5:225, 1936.

2 Craig, C. F.: "The Etiology, Diagnosis, and Treatment of Amebiasis," *The Williams and Wilkins Co.*, Baltimore, 1944.

3 Conan, N. J. Jr.: "The Treatment of Hepatic Amebiasis with Chloroquine," *Am. J. Med.*, 6:309, 1949.

4 Murgatroyd, F. and Kent, R. P.: "Refractory Amebic Liver Abscess Treated by Chloroquine," *T. Roy. Soc. Trop. Med. and Hyg.*, 42:15, 1948.

5 Emmett, J.: "Refractory Amebic Abscess of the Liver Treated with Chloroquine," *J.A.M.A.*, 141:22, 1949.

6 Berliner, R. W., Earle, D. P. Jr., Taggart, J. V., Zubrod, C. G., Welch, W. J., Conan, N. J., Bauman, E., Scudder, S. T. and Shannon, J. A.: "Studies on the Chemotherapy of the Human Malarias. VI. The Physiological Disposition, Antimalarial Activity, and Toxicity of Several Deriyatives of 4-Aminoquinoline," *J. Clin. Invest.*, 27:98, 1948.

The Use of Streptomycin in Tuberculosis and Pregnancy. Case Report

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There have been numerous papers on the problems and management of tuberculosis complicated by pregnancy but few reports on the use of streptomycin. In Watson's[1] first case, the patient received two grams of streptomycin daily for 95 days during the second trimester of pregnancy. The diagnosis was progressive tuberculous involvement of the left kidney. The second case received two grams of streptomycin for 90 days, also in the second trimester of pregnancy. The diagnosis was progressive, far advanced hematogenous pulmonary tuberculosis. Both patients showed improvement during and following streptomycin therapy, but their vestibular function was completely lost. Both delivered normal full term infants. The neonatal behavior was normal. The infants showed normal neuromuscular control and no evidence of vestibular damage at nine months of age.

Sala and Laplace[2] began the use of streptomycin at the Tornu Maternity Hospital in Argentina in May 1947. Their indications for the use of streptomycin were completely independent of the gravid state. The clinical form of the pulmonary tuberculosis was taken exclusively into consideration. The majority of the parturients arrived at the hospital with advanced and active pulmonary tuberculosis. There were more cases treated in the second half than in the first half of pregnancy. The overall results in the 23 cases treated were as follows:

1) Very good: or those recovering clinically with no x-ray sequelae, four cases or 17.3 per cent.
2) Good: clinical improvement with x-ray sequelae, six cases or 26 per cent.
3) Fair: clinically improved with no x-ray changes or evidence of increased pathology, eight cases or 34.7 per cent.
4) Poor: clinically worse and x-ray evidence of progressive disease, five cases or 27 per cent.

There were four deaths in the group of poor results. The authors felt that streptomycin therapy in severe cases of tuberculosis may serve as a prophylaxis against congenital tuberculosis as a result of intra-uterine contamination.

There were 13 who received streptomycin late in pregnancy and primarily in the postpartum period. The authors observed that

the therapeutic efficiency during this period was smaller than during the first or second half of pregnancy. Thus of 13 treated, five or 38.4 per cent were classed as poor. The authors therefore recommended the second half of pregnancy as the ideal period to begin treatment with streptomycin.

They did not observe any influence of the drug on the mechanics of delivery, on the placenta or on its delivery or on the neonatal period of the infants born of tuberculous mothers. Spencer, Spino and Silverman[3] reported a case of miliary tuberculosis and pregnancy. Streptomycin was begun in approximately the fourth month of the pregnancy and, the dosage was one gram daily. Labor was premature and spontaneous in about the 22nd week of gestation. The infant lived approximately 30 minutes after delivery and the placenta showed numerous caseous miliary tubercles. No tuberculosis was found in the post-mortem examination of the organs of the infant. The mother succumbed to tuberculous meningitis and tuberculous pyelonephritis about 22 months after admission to the hospital.

Case Report

S.R., a white female age 28 first noted sudden, severe pleuritic type pains in left chest about two weeks after delivery of a full term infant in June 1944. One week later she developed dry cough, severe chills and profuse night sweats. About six weeks postpartum her temperature rose to 104 degrees F. and subsided by lysis after five days of intensive sul-

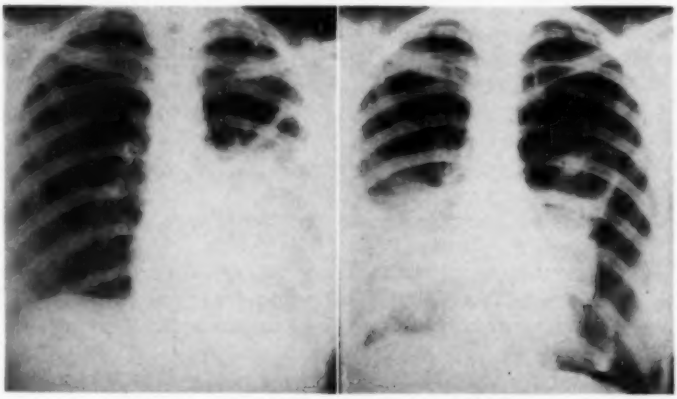

FIGURE 1 FIGURE 2

Figure 1: From admission x-ray film, revealing massive caseous pneumonic infiltration below level of left second rib anteriorly.—*Figure 2:* Film taken five weeks after induction of left pneumothorax. Note evidence of large ballooned-out cavity suspended by adhesions, the opaque lung below it and extensive spread to the contralateral lung.

fonamide therapy. An x-ray film of the chest at this time showed a moderately advanced lesion in the left chest. Sputum examination was positive for acid fast bacilli. She was admitted to a local sanatorium in August 1944. An x-ray film of the chest (Figure 1) on admission showed a large irregular cavity at the level of the left second anterior interspace. A large area of diffuse homogenous density was seen below the cavity to the level of the diaphragm. Scattered soft nodular infiltrations were observed in the left apex and the first anterior interspace. Left pneumothorax was induced on August 15, 1944. Evidence of a large ballooned-out cavity appeared in the x-ray film of September 21, 1944 and failed to close apparently because of band-like restraining adhesions.

A new diffuse homogenous density was also observed for the first time in the right lower lung field (Figure 2). Physical examination of the chest upon admission to the hospital for pneumonolysis revealed many coarse loud expiratory rales throughout both lung fields. The adhesions were severed by closed pneumonolysis on October 5, 1944. Sputum converted about one month later (Figure 3). Pneumothorax was continued at regular intervals and the amount and character of the collapse remained unchanged (Figure 4). There were occasional bouts of fever and increased expectoration of white or greenish mucoid sputum after pneumothorax refills. Her sputum continued negative for acid fast bacilli.

She became pregnant in February 1948, and noted no unusual effects until the first week in July which was early in the second trimester. At this time she complained of marked increase in cough and expectoration of greenish purulent sputum. Wheezing respiration occurred at rest and was increased by exertion. There was also dyspnea on exertion and substernal soreness. The sputum became positive for acid fast bacilli late in July and remained so until the middle of the following month.

The diagnosis of recurrent tuberculous tracheo-bronchitis was made on the basis of the past clinical and x-ray findings plus the present

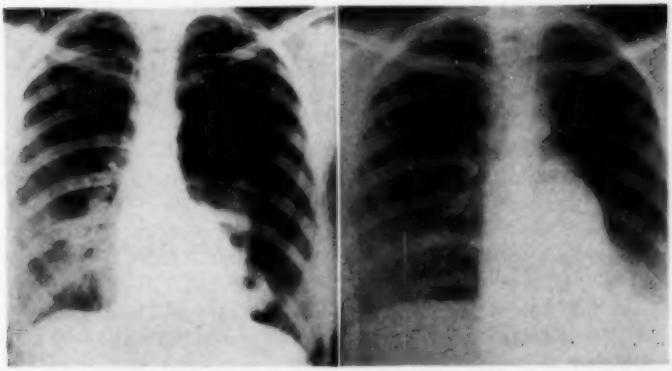

FIGURE 3 FIGURE 4

Figure 3: Film taken more than three and a half months following closed pneumonolysis. Small residual cavity still visible at level of third rib anteriorly. Note considerable clearing of lesions in right lower lobe.—*Figure 4:* Film taken almost four years after induction of pneumothorax showed characteristic opaque, completely collapsed, unexpandable lung.

findings of fever, cough, sputum, wheezing and acid fast bacilli in the sputum in the absence of a new visible parenchymal lesion to account for it. It was not possible to rule out secondary involvement with ordinary pyogens. She did not consent to bronchoscopy.

Streptomycin in 500 mg. doses was begun July 10, 1948 and penicillin in oil and beeswax (Romansky) was given in the opposite buttock. The dosage of penicillin was 300,000 units.

Within a week there was a marked diminution in the amount of cough and expectoration and the wheezing disappeared. During the first two weeks streptomycin was given daily and penicillin every second day. From the end of this period up to the time of six days after delivery, streptomycin was given in doses of 500 mg. every second day. The total amount of streptomycin was 25 gms. Penicillin was discontinued on July 30, 1948 after a total dose of 3,300,000 units. At no time during the course of administration of streptomycin did she experience nausea, vomiting, dizziness, or skin reactions.

She delivered spontaneously a normal full term infant (six pounds nine ounces) on September 4, 1948. There were no abnormal physical findings at birth. The placenta was also normal.

The condition of the child at varying times during the neonatal period showed no evidences of vestibular or hearing or visual defects. She sat up at six and walked at 12 months and in general behaved in a normal fashion. It was evident from early infancy that the child could hear well.

SUMMARY

1) A case of tuberculosis complicated by pregnancy is presented who developed presumptive evidence of tuberculous tracheobronchitis during the second trimester of pregnancy.

2) Streptomycin was administered and no harmful effects on the fetus or child were observed. No evidence of delayed damage to vestibular, auditory or ocular nerves appeared.

3) The management of tuberculosis in pregnancy may be facilitated by the use of streptomycin combined with other established measures.

RESUMEN

1) Se presenta un caso de tuberculosis complicado con embarazo que tuvo evidencias de traqueobronquitis tuberculosa durante el segundo trimestre del embarazo.

2) Se administró estreptomicina sin que se observaran malos resultados sobre el feto y después sobre el niño. Tampoco hubo pruebas de daño tardío auditivo, vestibular u ocular.

3) El tratamiento de la tuberculosis durante el embarazo puede ser facilitado con el uso de la estreptomicina combinada con otras medidas establecidas.

RESUME

1) L'auteur présente une observation de tuberculose associée à la grossesse où se développa une tuberculose trachéobronchique probable au cours du deuxième trimestre de la grossesse.

2) On fit agir la streptomycine, et il n'y eut aucune action fâcheuse le foetus. Il n'y eut pas non plus de lésion apparente des nerfs vestibulaires, auditifs ou optiques.

3) Le traitement de la tuberculose chez la femme enceinte peut être facilité par l'utilisation de la streptomycine combinée avec les autres moyens habituels de traitement.

The author is indebted to Dr. Louis Ibarra of Manteno State Hospital for his excellent translation of the Sala and Laplace article from the Spanish original.

REFERENCES

1 Watson, Ernest H. and Stow, Robert M.: "Streptomycin Therapy; Effects on Fetus," *J. A.M.A.*, 137:1599, 1948.
2 Sala, Sylvester L. and Laplace, Juan M.: "Streptomycin Therapy of Tuberculosis Complicated by Pregnancy," *Bulletin, Soc. of Obst. and Gynec.*, Buenos Aires, 28:98, 1949.
3 Spencer, George E., Spino, P. S. and Silverman, J. S.: "Miliary Tuberculosis and Pregnancy," *Am. Rev. Tuberc.*, 62:209, 1950.

Report of the Council of Tuberculosis Committees

The Council of Tuberculosis Committees of the American College of Chest Physicians has for the past ten years been active in stimulating the formation of tuberculosis committees in state and county medical societies.

At present, the Council in cooperation with tuberculosis committees of the state and county medical societies, is interested in collecting and disseminating scientific information on modern methods of controlling infectious diseases of the chest.

As most of our tuberculosis sanatoria are filled, many cases requiring hospital care are kept on the waiting list for months without benefit of modern methods of treatment. The remarkable development of specialized surgery for lung diseases, the broader use of collapse therapy, particularly pneumoperitoneum, and the discovery of potent drugs such as streptomycin and paraminosalicylic acid have all contributed to more effective tuberculosis control. The American Medical Association and the American Hospital Association have approved the proposal that facilities for the care of the tuberculous be provided for in general hospitals. A number of general hospitals in this country have already done so.

Our Council urges that all general hospitals admit all cases of diseases of the chest, including tuberculosis. An isolation ward with a few beds for the tuberculous could easily be provided in every hospital. This unit would not only be of great value in controlling tuberculosis, but would serve as a teaching center where hospital nurses could receive training in its care and treatment.

We also urge routine chest x-rays of all admissions to general hospitals. The value of this has been demonstrated in several large hospitals throughout the country where unrecognized cases of tuberculosis and other chest conditions are being discovered. The Joint Committee on Chest X-Ray of the American College of Chest Physicians and the American College of Radiology has endorsed this procedure as a screening method, and advises that all suspicious lesions be followed up on 14 x 17 inch films together with a clinical examination.

The following articles by Doctors Jacobs, Edlin and Neff present their experiences in connection with this problem.

COUNCIL OF TUBERCULOSIS COMMITTEES

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Tuberculosis in General Hospitals
Need for a Control Program

SYDNEY JACOBS, M.D., F.C.C.P.*
New Orleans, Louisiana

Every general hospital in this country no matter how large or how small, can help eradicate tuberculosis in its own community. It can best do this by organizing and conducting its own tuberculosis control program. No other single agency has the opportunities for quickly finding and treating tuberculosis as has the general hospital.

It has been estimated[1] that every year about 16,000,000 persons are treated in general hospitals of this country and that 40,000 of them have undiagnosed active pulmonary tuberculosis. Since these unsuspected disseminators of tubercle bacilli are not adequately isolated, they defy tuberculosis control measures until diagnosed. Tragically, they are within a few feet of the diagnostic instrument which is not used.

It is true that the death rate from tuberculosis is falling and that mortality rates are diminishing; yet it is equally true that we cannot stop our efforts at tuberculosis eradication so long as people are daily being needlessly infected with tubercle bacilli. The great fight against tuberculosis must still be waged daily and on many fronts.

Even though control measures are only one factor in the eradication of tuberculosis, they may very well be the decisive factor. Any device for finding, isolating and treating sputum-positive persons will materially decrease the ultimate number of tuberculosis patients. For this reason, no matter how a source of tubercle bacilli is discovered, and no matter what sum of money is spent to find this focus of infection, it is a good public health measure. General hospitals cannot escape their responsibility in this regard. In no other way with comparatively so little expenditure of time and effort can they render public service as to detect all tuberculosis within their walls.

In formulating its own tuberculosis control program, the general hospital would be immeasurably elevating the level of medical care afforded to all who are admitted for diagnosis and therapy. There is still much tuberculosis to treat and we must find it. There are still many tuberculous persons who need treatment for

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non-tuberculous conditions and this treatment is being rendered in our general hospitals. For this treatment to be given safely and for the control program to be conducted intelligently, at least three factors must be stressed: early diagnosis by routine chest x-ray examination; proper isolation of infectious patients; and prompt treatment of those found to have active pulmonary tuberculosis.

No Undetected Tuberculosis Among Patient or Personnel

There is one way, and only one way to find cases of tuberculosis early and easily: to x-ray all patients on admission and personnel periodically. This idea is not new; it is not unproved; but it is, far too often, unused. The lag between knowledge and practice is nowhere better illustrated than in the slowness with which general hospitals have instituted the routine chest x-ray examination of all patients at the time of admission. Oatway[2] in 1948 found only 247 of 4,539 general hospitals in this country routinely taking admission chest x-rays. Of all hospitals knowingly admitting tuberculous patients 16 per cent routinely x-ray all admissions, but only 1 per cent of those not knowingly admitting tuberculous patients did so.

Routine photoradiography of the chest is a good means of finding the significant lesions of tuberculosis. About one half of all cases of tuberculosis progress as long as two years before symptoms develop. Therefore many cases will be asymptomatic when detected by routine examination.

In 1925, Ralph Kinsella and his co-workers took routine chest x-ray films of all persons admitted to St. Mary's Hospital in St. Louis and found more significant disease than they did by routine urinalyses and Wasserman testing. Many other similar surveys have been conducted. In the Meyer Memorial Hospital[3] of Buffalo after a period of two years, the uncorrected figure for unsuspected tuberculosis was 3.7 per cent. When corrected by postmortem findings and by positive sputum examinations, the figure dropped to 1.8 per cent. At least 2.5 per cent of all new patients were proved to have pulmonary tuberculosis of clinical significance.

Because of the expense of the conventional x-ray technic, comparatively few hospitals were willing to follow the lead of these pioneers. With the advent of the more economical photofluorography, many of these objections disappeared. For example, using the 70 mm. technic, Golley[4] found 3.7 per cent of 5,187 routine admissions to have tuberculosis and of these 92 per cent were minimal. These observations indicate a greater "yield" of tuberculosis than in the population at large. Obviously people who are sick and come to a hospital for relief are more apt to have

tuberculosis than those who merely come to a trailer for a film, being attracted there by the blare of a loudspeaker or the moral persuasion of an employer. For example, at the Charity Hospital of Louisiana in New Orleans,[5] where 325,000 routine admission chest x-ray films have been taken since a 70 millimeter photofluorograph was installed in the admitting department in 1946, the annual incidence of films justifying the suspicion of tuberculosis has varied between 2.37 and 4.2 per cent. At the same time, surveys of the population at large in New Orleans showed that approximately 1.5 per cent of all surveyed were suspected of having tuberculosis. That suitable selection will increase the yield of suspects is indicated by the fact that inmates of the Parish Prison averaged 4.26 per cent suspects. Many persons belonging to special groups may be difficult to collect for a survey, but they eventually go to a hospital for medical attention. Pregnant women represent a group which should be particularly surveyed for tuberculosis. Not only are hospital surveys apt to show a higher incidence of tuberculosis, but also they are apt to show a greater incidence of advanced disease. In most surveys about 80 to 84 per cent of all active cases are minimal; in the study of patients admitted to the Charity Hospital, only 28 per cent were minimal, 31 per cent moderately advanced, and 41 per cent were far advanced.

Hospital surveys find the active case more cheaply than do the other methods of search. In a hospital the cost is chiefly that of developing and interpreting films; in the field there are these costs, of course, but clerical costs are greater and there are additional costs of health education and of follow-up. In the average survey, using a mobile bus it is necessary to prepare the way with a costly health educational effort. On the contrary, anyone going to a hospital these days expects x-ray films and other tests; consequently no special effort is needed to have him fall in line for his repeat x-ray film. If special follow-up studies are needed, these can be easily conducted by the hospital physician. The cooperation of the patient does not often have to be solicited and one avoids emotional peaks and valleys. Some hospitals will find it cheaper to use 14 x 17 inch films with their existing x-ray facilities than to install photofluographic equipment; the accuracy of results depends not so much on the film used as on the interpreter.[6] Regardless of the equipment used, it is still cheaper to detect tuberculosis early than to treat the advanced disease later.

II. *Isolate All Patients with Positive Sputum*

This is perhaps one of the most difficult ideas to put across: that it is possible to isolate effectively in a general hospital without elaborate facilities. Unfortunately we are the victims of our

own propoganda; most nurses and physicians fear tuberculosis and believe that tuberculous patients in a general hospital[7] will be a menace to other patients and to the staff. The institution too small to have a separate isolation wing can designate one or two rooms for this purpose; and even the ordinary private room of a hospital can be suitably arranged for a contagious diseases technic if this is intelligently planned and meticulously followed.[8] It is time that we insist that each patient with a suggestive pulmonary lesion have repeated sputum examinations until it is possible to declare with a reasonable degree of assurance whether the patient is disseminating tubercle bacilli. If he is, he should be placed in isolation, but he should not be regarded as a social pariah. If more of our physicians understood the pathogenesis of tuberculosis, they would understand the value of isolation and would be able to transmit to nurses the safety of using ultra-simple methods of preventing sputum dissemination. Many student nurses and interns obtain comparatively little training in the practice of an isolation technic; such experience is an integral portion of their education. Experience with tuberculous patients is essential to a logical and well-ordered understanding of internal medicine in general and pulmonary diseases in particular.

III. *Treat All Cases Energetically*

In a general hospital there is a golden opportunity to start treatment immediately after the diagnosis has been established. Hospital surveys shorten the time interval between diagnosis and therapy. A patient in a general hospital whose tuberculosis is discovered by routine x-ray inspection can quickly be treated at once if the circumstances justify this or he can be transferred to the tuberculosis division of the hospital or to a sanatorium. While it is true that many, if not most, patients with tuberculosis should be treated—at least at the onset of their illness—in a special institution for the tuberculous, this is by no means an invariable rule. The blunt truth is that in many portions of this country, there are simply not enough beds in the places where those who need them can use them. Again, many patients who wait for a long time to gain admission to a sanatorium will desert because they will not or cannot make a suitable adjustment to sanatorium life. Not every patient needs sanatorium care. Indeed, one of the virtues of case finding in a general hospital is that of detecting the pre-symptomatic lesion. Often a prolonged sanatorium stay can be averted by the intelligent use of a short stay in a general hospital where with the judicious use of anti-biotics and collapse therapy the patient can become non-infectious and can continue his treatment either as an out-patient or as a bed patient at home

To the conventional sanatorium this approach, utilizing so-called "ambulatory pneumothorax," is not acceptable. To those practicing physicians[9] who have successfully used this method for years, knowing well its limitations, this method has been a means of successfully rehabilitating many patients.

The traditional attitude of general practitioners toward tuberculosis and tuberculous patients has changed greatly. Formerly they were reluctant to treat patients with tuberculosis and insisted on referring them to a tuberculosis institution as soon as the diagnosis had been established, realizing quite well that for many patients this was an impracticable prescription. With the advent of anti-biotics, many practitioners are now accepting for treatment patients whom formerly they would have rejected. To assist in beginning therapy, it is essential to have adequate hospital facilities. The general hospital can render great service to the community in making it possible for these cases to be started on therapy in an isolation room of a general hospital.

The more vigorous surgery of the present day has opened a new era. Surgeons are boldly opening the thorax much more often than in former years. No one can understand even the beginnings of thoracic surgery without an understanding of tuberculosis. With even a small isolation unit, it is possible to perform excellent thoracic surgery. The tempo of our surveys in large cities will mean that many persons will inevitably submit to thoracic surgery for the otherwise undiagnosable thoracic lesion. Some of these lesions will be tuberculous and will require the use of an isolation unit during surgical convalescence. Other lesions, frankly tuberculosis, will be treated by thoracoplasty or by surgical resection. For such it is essential that the hospital have an isolation unit.

SUMMARY

Every general hospital can speed the ultimate eradication of tuberculosis in this country by adopting its own tuberculosis control program. This program should emphasize at least three features: routine admission chest x-ray films for all patients and periodic chest x-ray films for personnel; isolation precautions for patients with sputum containing acid-fast bacilli; and provisions for prompt therapy of all patients found to have active pulmonary tuberculosis. No matter how large or how small the general hospital, it can find a form of routine x-ray examination best suited to it. Indeed, if a general hospital is to provide adequate medical and surgical service to its patients, it must have some type of admission chest x-ray inspection.

RESUMEN

Todo hospital puede acelerar la definitiva erradicación de la tuberculosis en este País, adoptando su propio plan de control de esta enfermedad. Este programa debe enfatizar cuando menos tres características: Radiografía de admisión como rutine para todos los enfermos que ingresen, y radiografía periodica para el personal; precauciones de aislamiento para los enfermos que tienen esputos positivos al bacilo acido-resistente; y provisión para el inmediatotratamiento de los enfermos de tuberculosis activa. No importa que el hospital sea pequeño o grande; puede encontrarse una forma de examen a los rayos X como rutina adecuado para él. Es un hecho que, si un hospital general ha de proporcionar adecuado servicio quirúrgico y médico a sus enfermos, debe tener alguna forma de inspección a los rayos X para todos los casos que ingresen.

RESUME

Tout hôpital général peut contribuer à l'éradication de la tuberculose dans notre pays en adoptant son propre système de contrôle anti-tuberculeux. Ce programme doit être basé au moins sur trois points: radiographie de routine du thorax pour tous les patients à leur admission et radiographies périodiques des membres du personnel; précautions à prendre pour isoler les patients qui présentent des bacilles acido-résistants; et enfin il faut envisager la possibilité du traitement immédiat pour tous les malades trouvés soufrant de tuberculose pulmonaire active. Peu importe que l'hôpital général soit grand ou petit, on peut adopter la forme d'examen radiographique de routine qui convient le mieux. En effet, si un hôpital général doit fournir à ses patients des soins médicaux et chirurgicaux adéquats, il doit établir un certain système d'examen radiographique du thorax.

REFERENCES

1 Plunkett, E. and Mikol, X.: "Unrecognized Tuberculosis in General Hospitals," *Amer. Rev. Tuberc.*, 41:381, 1940.
2 Ootway, W. H. Jr.: "The Current Status of Routine X-raying in General Hospitals of the United States," *Arizona Med.*, 6:23, 1949.
3 Seatchard, G. N. and Duszynski, D. O.: "Routine Chest Roentgenograms of Hospital Admissions," *Dis. of Chest*, 13:312, 1947.
4 Golley, P. M.: "Routine Chest Photo-Roentgenography in Baroness Erlarger Hospital, Chattanooga, Tennessee," *Amer. Rev. Tuberc.*, 60: 377, 1949.
5 Jacobs, S.: "The Charity Hospital Chest X-ray Unit," *New Orleans M. and S. J.*, 103:298, 1951.
6 Birkelo, C. C., Chamberlain, W. E., Phelps, P. S., Schools, P., Zacks, D. and Yerushalmy, J.: "Tuberculosis Case Finding—A Comparison of the Effectiveness of Various Roentgenographic and Photofluorographic Methods," *J.A.M.A.*, 133:359, 1947.
7 Myers, J. A.: "Fifteen Reasons why General Hospitals Should Serve Tuberculous Patients," *Hospital Management*, 23:35, 1927.
8 Myers, J. A.: "Tuberculosis Among Children and Adults," Third Edition, *Charles C. Thomas*, Springfield, 1951.
9 Jacobs, S.: "Artificial Pneumothorax; the Treatment of Ambulatory Patients with Tuberculosis," *New Orleans M. and S. J.*, 92:446, 1940.

The Tuberculosis Patient in the General Hospital

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We have come a long way from the day when Dr. Janeway advised Dr. Trudeau to "stay out in the open and ride horseback." Our therapeutic armamentarium has gone beyond the days of the patient freezing in his bed or chair on an open porch. Our attack on tuberculosis has become multiple and versatile with more intensive propaganda and education, case finding and mass x-ray surveys and we have added to the basic principle of rest such measures as pneumothorax, pneumoperitoneum, thoracoplasty and resection surgery. The comparatively recent discovery of antibiotics has further strengthened our hand.

Despite these advances of which we may be justly proud, the tuberculosis problem remains acute and unsolved. This disease still extracts its toll of 40,000 to 50,000 deaths in this country annually. The tuberculosis death rate still ranges near 22 per 100,000 population and it has been estimated that there are approximately 500,000 active cases of tuberculosis in the United States.

According to the American Trudeau Society, the minimum number of beds needed for the care of the tuberculous is two and one half per annual death and the recommended number is three per annual death.

In the February 1950 issue of Public Health Reports a report of "Tuberculosis Facilities" by Reed and Bloomquist informs us that only about 8 per cent of the total existing hospital beds are set aside for care of tuberculous patients. This amounts to 93,852 of which 12,393 were declared non-acceptable because of obsoleteness, fire or health hazards. The authors point out that we need a minimum of 146,926 tuberculosis beds which means that we must add at least 67,477 beds to the present inadequate total.

Our efforts at case findings have resulted in larger and larger numbers of discovered cases. As a consequence our tuberculosis hospitalization program has been strained to the utmost and our tuberculosis hospitals and sanatoria are, figuratively, "bursting at the seams." We have labored to find cases and when we have found them we have been faced by seemingly endless waiting lists for hospital admissions. All our principles of segregation of active

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cases, all our efforts to prevent spread of the disease and all our hopes of early application of our newest forms of therapy are balked by this bottleneck.

Tuberculosis cannot be eradicated until every active case of this disease has been detected, isolated and treated until he is no longer infectious.

The solution lies in making more beds available but the present high level of building costs has acted as a brake on the tuberculosis hospital construction program. It would be less expensive and more practical to utilize or expand presently existing facilities in general hospitals. Not only is this desirable as an emergency expedient but it is our firm conviction that the establishment of self-contained tuberculosis units in general hospitals is a very practical goal for many important considerations in addition to the financial one.

Fear of tuberculosis has been a major factor in the isolation of this disease to distant sanatoria—fear on the part of the hospital administrator, the physicians, nurses, employees and the general public. It has long been felt that once the tuberculous case has been diagnosed the general hospital's function becomes one of facilitating disposition to a sanatorium.

Re-education must obviously be complete and a greater knowledge of the disease and the possibilities for safe handling must be taught at every level to medical students, nurses, hospital personnel and the general public. Teaching has suffered by the isolation of the tuberculous patient in comparatively inacessible sanatoria. The medical profession and its co-workers have come to regard the tuberculous patient as a menace to be diagnosed and transferred. This is a process of escape and can never help to solve the problem. The tuberculosis unit can be integrated with the hospital and all the facilities of the general hospital can be utilized. Patients with tuberculosis are not spared other diseases. They are subject to all the other ills that flesh is heir to and the staff of the general hospital should be available for consultation and treatment. All too often, under our existing system, the patient who has an acute appendix or other surgical problem must be transferred to other institutions for the acute condition and then must be re-transferred to the sanatorium. The existence of a tuberculosis unit in the general hospital is of definite educational value and tends to keep the general staff on its diagnostic toes. The exchange of knowledge between specialities is facilitated and the phthisiologist and thoracic surgeon will benefit as will the general practitioner and specialists in other fields.

We must also take into consideration the great hardship that is created for the tuberculous patient and his family when we

isolate him in outlying sanatoria. The separation from family is a definite psychological hazard to the patient's acceptance of a long period of isolation and bed rest. His uneasiness concerning his family's welfare is a detriment in his cure. The long trips to the sanatorium are a physical burden to the family and often strain an already meager budget.

As a result of these considerations and with the whole-hearted cooperation of Dr. Marcus Kogel, Commissioner of the Department of Hospitals of New York City, and Dr. Alfred Richman, Medical Superintendent of the Manhattan General Hospital, a tuberculosis unit was established at that hospital on February 21, 1949 with a capacity of 134 beds with a second section of 106 beds opened on January 14, 1950 for a total of 240 beds. The unit was established for the care of city patients and their care was to be paid for by the City of New York.

The hospital is a proprietary hospital of 525 bed capacity, caring for private and semi-private patients. It is located in downtown Manhattan, in the midst of an urban community. The tuberculosis service is located on the third and sixth floors of the hospital. The unit has a private admitting department and all visitors to this unit are taken in a separate elevator to the respective floors of the unit. Patients are admitted to the hospital through the offices of the Hospital Admission Bureau, Tuberculosis Division, as transfers from other institutions or as direct admissions. Four residents are assigned to the tuberculosis service. These physicians have had previous experience in tuberculosis but, in addition, it is our plan to enable graduates of grade A schools to undertake internships in tuberculosis. The resident staff is under the supervision of a complete staff of phthisiologists and thoracic surgeons. Physicians on the staff of the Manhattan General Hospital specializing in cardiological, gastrointestinal, gynecological, eye, ear, nose and throat, dental and general surgical diseases are assigned to the tuberculosis staff and are available for consultation. A rapport is maintained with the staff of the general hospital and all physicians are invited to attend the conferences and lectures held by the tuberculosis staff. All forms of medical and surgical collapse therapy are performed and a special operating room has been assigned to the unit. A complete laboratory has been installed and is equipped to perform all necessary examinations. X-ray and fluoroscopic units are available for both floors and a tomographic x-ray apparatus is provided for special studies. In addition, a photo-roentgen unit provides for a chest film of every admission to the general hospital.

Each unit has its own dishwashing department and all dishes and utensils remain in the individual units and are sterilized on

the respective floors. All food is brought to the units from the main kitchen on a carrier and is transferred to electrically heated food trucks from which they are served. Dishes and utensils are cultured regularly for bacterial growth.

All nursing and attendant personnel receive pre-employment x-ray examination of the chest and are re-checked at regular intervals. At present there is one nursing supervisor for the unit and thirty nurses who are assisted by 19 attendants and orderlies.

During the year 1950, 771 patients were cared for, 576 of whom were male and 195 female, constituting a patient day census of 99,901.

City tuberculous patients in Hospital as of January 1, 1950	188
City tuberculous patients admitted during 1950	583
TOTAL under care during 1950	771
City tuberculous patients discharged during 1950	383
City tuberculous patients deaths during 1950	63
TOTAL deaths and discharges	446
TOTAL days care for city patients during 1950	99,901

Educational films provided by the New York Tuberculosis and Health Association are utilized in the orientation of patients and a series of lecture and question periods are held.

The rehabilitation of controlled cases is an essential part of a tuberculosis service. Patients are placed under the supervision of one of the attending physicians and their increase in activity guided. Arrangements are made with the New York Tuberculosis and Health Rehabilitation and other similar services for the teaching of new skills and job placement. A full time Social Service worker is assigned to the unit and cares for the psychological and social problems that may arise, in addition to assisting with occupational therapy and rehabilitation.

An attempt is made to place some of the patients in jobs as attendants and orderlies within the tuberculosis unit so that they may increase their work activity under supervision.

The table on the following page outlines the type and number of procedures performed during the year 1950 and gives an idea of the scope of service rendered.

Because of the increasing demands for beds, an annex was opened in Brooklyn, New York with a 110 bed capacity. This extension has its own laboratory and x-ray equipment and is staffed by two residents under the supervision of the staff of the main hospital.

Arrangements are in progress with the Department of Hospitals for the establishment of a follow-up clinic so that cases discharged

Pneumonolyses	9	Cystoscopy	2
Thoracoplasty	11	Intravenous pyelogram	2
Pneumonectomies	8	Tonsillectomies	2
Cavernostomies	3	Hemorrhoidectomies	4
Tube thoracotomy	1	Rectal fistulatomy	4
Repair bronchus	1	Biopsy	1
Pneumothorax refills	197	Herniorrhaphy	12
Phrenic crush	59	Body cast	1
Bronchoscopies	72	X-ray films	2716
Pneumoperitoneum refills	6228	E.K.G.	77
Aspirations	104	Appendectomy	1
Transfusions	47	Consultations (Medical and Surgical)	147

from the hospital can be adequately supervised and collapse therapy continued. This clinic will offer all necessary services including examination of new cases and examination of suspects and contacts. Hospitalization can be effected directly when indicated.

The question that will arise in the hospital administrator's mind is the one of insurance and compensability. He will be concerned with the possibility of tuberculosis occurring in his employees as a result of contact with open cases of tuberculosis. It must be emphasized that this occupational hazard exists in the general hospital just as much as in a tuberculosis institution. It is our contention that the danger is greater in the general hospital where there is no awareness of infection and where active tuberculosis cases lie unsuspected on surgery, medical and maternity wards. There the failure to take proper and easily carried out precautions gives rise to real hazards to personnel and patients. It has been our experience that as many, if not more, cases of tuberculosis arise in this way as will develop in a tuberculosis institution. The known case is a minor risk; the unknown case, a great menace.

Insurance rates should not rise with the establishment of tuberculosis units in general hospitals. As a matter of fact, the greater awareness of the disease, careful x-ray film screening of all patients, pre-employment and routine x-ray films all serve to decrease the risk.

It must be realized that a two way risk exists. Personnel can infect patients as well as vice versa. Real prevention and control can only be established when the entire hospital population is integrated into the plan for reducing this occupational disease hazard.

SUMMARY

We wish to urge that the incorporation of a tuberculosis unit in the general hospital be given serious consideration as an important step in the control of tuberculosis. Our experience with such a unit in the Manhattan General Hospital has proved it to

be practical, workable and of great value to the hospital and the community as a therapeutic and educational center.

RESUMEN

Queremos insistir en la necesidad de incorporar dentro de todo hospital general una unidad de tuberculosis como un paso serio para el dominio de la tuberculosis. Nuestra experiencia en el Hospital General de Manhattan ha demostrado que éste es práctico, factible y de gran importancia para el hospital y para la comunidad como un centro de tratamiento y de educación.

RESUME

Comme facteur essensiel dans la lutte contre la tuberculose, nous désirons insister sur l'importance de l'incorporation d'une unité anti-tuberculeuse dans un hôpital général. Notre expérience, au Manhattan General Hospital, avec une telle unité, a démontré que cette organisation était pratique, d'application facile et d'une grande valeur pour l'hôpital et le public en général, comme centre de traitement et d'éducation.

The Practical Use of an Isolation Ward in a General Hospital for the Treatment of Tuberculosis

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Civilization today demands the modern hospital and compels the development of hospital facilities that will keep it abreast with the advancement in modern medicine. Our present hospitals have grown from the simple and humble "boarding house" for the sick, to a vast system where there is assembled not only scientific equipment, devices and methods for performing the practices required by scientific medicine, but a group of professionally trained personnel to conduct the services and perform the tasks which are essential to the proper handling of diagnostic and therapeutic measures according to the best scientific principles.

The modern hospital has become the place of first resort in time of illness and disease and the community must possess this vital facility with service for all classes regardless of the patient's ability to pay. Increasing interest in hospital care is a community responsibility which is most gratifying and the modern hospital is commanding greater recognition as one of the indispensable elements in the program of public welfare. The demands made upon the modern hospital by scientific medicine are highly varied and enormous. Let us ponder for the moment the requirements of the modern hospital including the elaborate and expensive laboratory equipment, x-ray apparatus, operating equipment, with all of the latest devices used in this area, including anesthesia apparatus; the special diet kitchens with equipment to bring everything necessary to the bedside of the patient; the engineering plant, laundry and many other features essential to the complete care of the patient. Few people have an idea of the number of personnel required to staff the modern hospital. Physicians, pathologists, roentgenologists, technicians, highly trained nurses, interns, expert dietitians, student nurses, kitchen workers, engineers, social service workers, record librarians, office workers, maids, orderlies, housekeepers, executives and many others. The gathering of this large number of highly trained and professional personnel to concentrate on the care of patients in the modern hospital gives recognition to the fact that the facilities available are broad in scope and should be conducted in a coordinated man-

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ner as will enable the institution to fulfill it's obligations to the community in the care of all types of patients. Why not let the tuberculosis patient and attending physician have the advantage of all these facilities which might be prohibitive in institutions devoted exclusively to the care of tuberculous patients.

In the past, general hospitals have been too much inclined to limit their services to selected types of patients and unfavorably disposed to accept patients suffering with mental illness and communicable diseases including tuberculosis, all of which require special isolation facilities. The American hospital system includes a large number of specialized institutions, which together with the general hospitals are expected to supply demands of the entire field of modern medicine.

In virtually all communities the hospitals for the care of specialized types of illness are overcrowded with large waiting lists. General hospitals are also taxed for the most part beyond the normal occupancy rate, and there has been a failure on the part of the general hospital to provide isolation units because of this overcrowding.

A general hospital is predominantly an institution of populous areas and numerous sparsely populated centers have inadequate facilities. A better distribution of general hospital service is imperative, and much promise is given by the program set up by the Hospital Survey and Construction Act (Public Law 725) which provides funds on a grant-in-aid basis for the establishment of new hospitals and the enlargement or improvement of those already in operation. This plan envisions a coordinated system of general hospitals and health centers with a broadened program of service covering all categories of illness. It provides for the improvement and enlargement of special hospitals. It emphasizes the necessity for enlarging facilities to meet the medical needs of the chronic, the mentally ill and the tuberculous patient. This plan marks the beginning of a coordinated general hospital system in the various states, where affiliation in the several areas may be established with existing hospitals, taking into consideration the type and conditions of such facilities. It recognizes those areas where general hospitals are concentrated as proved areas of use able to provide comprehensive service. Such areas are designated as base hospital communities to be developed as consultative and teaching centers. Since trained personnel are now located in these hospital communities such areas are best able to expand and broaden their programs. This makes it possible for general hospitals to provide additional beds for the care of specialized patients if so desired and encourages such expansion in order that the general hospital may more completely fulfill

it's obligation to the community by providing services for mental diseases and all types of communicable diseases including tuberculosis. The funds made available under this act should mean that general hospitals in the near future will be taking advantage of the offering and establish these accommodations where they now do not exist.

Modern highway development and public transportation facilities make it possible for the coordinated service with a central base hospital unit where more complete facilities are available for the difficult cases requiring specialized care. Tributary hospitals should have facilities for handling the average emergency case, but should not be counted upon to provide all the facilities as may be necessary today in dealing with the complicated cases which require every possible device and skill which modern medicine requires. With provision for tuberculous patients in the hospitals envisioned under this plan, we shall have a service with not only an expanded, but a more widely distributed service.

The modern hospital is the exclusive laboratory for the training of physicians, nurses, dietitians, medical social workers and allied professions. The education of professional personnel, therefore becomes an obligation of the modern hospital and in view of the demands for trained personnel in all branches of public health and medical care, the general hospital can hardly fulfill it's obligations as an educational institution without clinical facilities for the teaching of workers who will engage in all types of public health and medical and surgical service including tuberculosis, other types of communicable disease and mental illness. Where the general hospitals do not have provision for the care of these various types of patients, they find it necessary to establish affiliations with specialized institutions in order to provide training for young physicians, nurses and the allied professions. With these facilities therefore, the educational program of the general hospital is broadened and held under more centralized control of the parent institution rather than through the diversion of this teaching activity to affiliated sources in specialized institutions. In many states today we find that advancing standards in nursing education are jeopardized for the want of adequate affiliation services in tuberculosis institutions and a lack of clinical facilities in general hospitals. This teaching service is strongly emphasized in the modern program of nursing education. Today we find a severe shortage of nurses with the proper training to care for tuberculous patients on account of this limited educational facility, both in the basic and the advanced levels of nursing education.

We find that surveys of health facilities in many communities

have resulted in recommendations being made that general hospitals add beds to their facilities for the care of tuberculous patients. These recommendations are being made in full recognition of the fact that the tuberculous patient can be cared for advantageously in the general hospital and that the organization and development of this service in a general hospital is possible at a moderate cost. It is gratifying to note the changing attitude in the thinking of specialists in chest diseases, nurse educators and hospital leaders who favor the general hospital as a facility for the care of tuberculous patients. Tuberculosis Associations have been recommending for a number of years that isolated areas in both wards and private rooms be reserved in general hospitals for the care of these patients. The American Hospital Association long ago went on record deploring the reluctance on the part of general hospitals to care for tuberculous patients. In 1946 the Council on Professional Practice of the American Hospital Association published a report recommending the establishment of facilities in general hospitals for the care of tuberculous patients outlining the management of tuberculosis in the general hospital. It is definitely proved that it is possible to protect hospital personnel from tuberculosis by the use of the proper techniques which for the most part correspond to those techniques taught for the handling of other communicable diseases in general hospitals.

Possession of the numerous types of modern scientific equipment which the general hospital contains today together with the services of the experts in the medical and nursing fields which are available in the general hospital can be used to very excellent advantage and provide full application of every known facility for the treatment of the tuberculous patient. Many facilities will therefore be found in the general hospital which can be regarded as adjunct service in the treatment of these cases which perhaps cannot be justified in a sanatorium designed exclusively for the care of tuberculous patients. Facilities in the general hospital may consist of a division or department as a separate unit. Admission to these units may be made on the basis of temporary hospitalization during which period the patient undergoes intensive diagnostic study if he is unconfirmed as a tuberculous case at the time of admission or the patient may be handled on a more permanent basis for complete treatment which might include chest surgery and rehabilitation measures. Bed capacity of these units is best regulated according to the needs of the community as well as in proportion to the total number of beds which may be contained in the general hospital.

Here at the Methodist Hospital the Isolation Unit is open at all times for the admission of tuberculous cases. Considerable chest

surgery is done on both the infective and non-infective cases. Specialized nursing service has been developed for the care of these surgical cases in the isolation area and for a time both types of cases were kept there, the infective as a matter of necessity and proper technique and the non-infective cases in order that this group might receive the specialized nursing care. It was not long until it was found to be impracticable to keep these non-infective cases in isolation. It interfered with good nursing and administrative routine in the isolation area to have both types of cases under the jurisdiction of one supervisor and the limitations on visitors as well as the techniques and other features were not favorably accepted by the patients. Plans were then made to set up a small unit in the general area of the hospital for the non-infective cases and to provide them with the same type of specialized nursing service as given in the isolation unit. At present, therefore, we have the two units with specialized nursing service. As we recognize the need for these facilities in the general hospital we do not acknowledge that all tuberculous patients should be treated in this type of institution to the exclusion of the expansion and perhaps the addition of new establishments for the exclusive care of patients in tuberculosis institutions.

The nursing service would be extended to the unit with a supervisor trained in aseptic technique. In fact, the same technique which has been taught in the handling of communicable diseases will ordinarily be found adequate to give proper isolated care to tuberculous patients. The resident staff service of the hospital may be extended to this unit. The food service, according to the technique in the handling of cases of communicable disease may also be extended as well as other services in the hospital which can contribute to a complete program of care on a highly professional level. This unit can be the source of great satisfaction to the administrator in a large hospital where it is not at all unusual to have general cases admitted to the institution and within a few days learn that a patient is suffering from tuberculosis, which then makes it necessary to immediately transfer him to the isolation area for continued treatment.

We find that medical men specializing in the care of chest diseases find their staff membership in a general hospital much more stimulating and beneficial when that general hospital may have facilities for the care of their tuberculous patient. They have the benefit of consultative services of other physicians on the hospital staff as well as a realization that all of these numerous services afforded by a general hospital organization are available for the care of their patients.

With the growth of surgical practice in chest diseases it becomes all the more important for modern hospitals with all of their appurtenances and services for handling surgical procedures to make these available in the treatment of thoracic surgery cases. Specialized nursing care for these cases can be planned and developed at a high degree of efficiency in the tuberculosis area. The medical specialist who has available for his use these facilities in the general hospital will find an advantage from the standpoint of time saving. It is a matter of satisfaction to the hospital administrator to be able to provide this complete service for the members of the hospital staff, specializing in the treatment of patients with chest diseases. They deserve, as a matter of fact, the same consideration for their patients as other physicians on the staff.

With too much emphasis on the use of the general hospital in the treatment of tuberculosis, the impression might be given that the modern hospital should handle these cases to the extent that specialized institutions shall not be further developed and used to full advantage. General Hospitals only make available additional service with their specialized facilities. Long term cases, particularly requiring only bed and nursing care would find less need for the general hospital and with favor for the sanatorium.

When general hospitals provide special services for the treatment of the case with separate units, special staff and all facilities as necessary it is only natural that financial considerations make it necessary to keep these units well occupied. If the community expects the general hospital to provide this service, it must expect to provide the patients. This is particularly the responsibility of the physicians of the community.

The general hospital's responsibility therefore, shall be toward many patients in the diagnostic and the more active stages of tuberculosis. In the later stages this responsibility of the general hospital lessens and the specialized tuberculosis agencies enter the picture for the continued long term care of the patient.

SUMMARY

1) The general hospital has a responsibility to provide beds for tuberculous patients and a growing acknowledgment is present of this responsibility on the part of the medical profession and its allied groups.

2) A well equipped general hospital with an organized medical service, with diagnostic aid services, auxiliary services, surgical facilities and other modern devices in medical practice, affords service for the tuberculous patients which is not always present in specialized institutions for the care of tuberculous patients.

3) Isolation units in the general hospital supplement and augment the service rendered by tuberculosis hospitals and does not in any way replace those services.

4) Special facilities for chest surgery are afforded in the general hospital.

5) Sanatorium type of institutional care is advocated for long term care of tuberculous patients.

RESUMEN

1) El hospital general tiene como responsabilidad el proveer de camas para tuberculosos y cada vez se reconoce más esta responsabilidad por los médicos y los grupos conexos.

2) Un hospital general bien equipado con servicio médico organizado, con servicios de diagnóstico auxiliar, facilidades para la cirugía y otros requerimientos de la práctica moderna, proporciona a los tuberculosos un servicio que no siempre puede obtener de las instituciones especializadas para el cuidado de los tuberculosos.

3) Los servicios de aislamiento en los hospitales generales suplen y aumentan el servicio prestado por los hospitales de tuberculosos y no los substituyen en modo alguno.

4) Facilidades especiales para cirugía de tórax son obtenibles en el hospital general.

5) El tipo de sanatorio está dedicado al tratamiento de los tuberculosos por largo tiempo.

RESUME

1) L'hôpital général se doit de fournir des lits pour les malades tuberculeux. On se rend de mieux en mieux compte actuellement de cette responsabilité parmi les médecins et leurs collaborateurs.

2) Un hôpital général bien équipé comprend un service médical organisé, tous les services auxilliaires de diagnostic, les facilités chirurgicales, et les autres possibilités modernes de la pratique médicale. Un tel service a les moyens d'assurer le traitement des tuberculeux, ce qui n'est pas toujours le cas dans les établissements spécialisés pour le traitement de ces affections.

3) Les services d'isolement dans l'hôpital général ajoutent leurs possibilités à celles des hôpitaux spécialisés pour tuberculeux, mais ne les remplacent en aucun cas.

4) L'hôpital général apporte des facilités particulières pour la chirurgie thoracique.

5) Les établissements de type sanatorial sont destinés aux tuberculeux dont l'état nécessite un traitement à long terme.

Editorial

In 1926 Ray Lyman Wilbur published an article entitled "The Lag in the Health Program." He especially called attention to the years and decades that often exist after facts and procedures have been well established before they are generally applied. The use of general hospitals in the tuberculosis program is a striking example of such a lag. As early as 1895 Dr. Lawrence Flick of Philadelphia founded a free hospital for poor consumptives with the program based on the care of the tuberculous in special wards of general hospitals. This plan was successfully operated for more than a decade. In Hartford, Connecticut, a general hospital set aside beds for tuberculous patients in 1902. When the International Congress on Tuberculosis met in Washington in 1908, a resolution was adopted, recommending that general hospitals provide beds for tuberculous patients. Five years later the National Tuberculosis Association fully endorsed this plan. In 1916 this organization in a special resolution again recommended it. The American Medical Association and the American Hospital Association passed resolutions endorsing this same plan in 1921. In 1927, Wahlquist et al., published an article presenting 15 reasons why general hospitals should serve tuberculous patients. A committee on the care of tuberculosis in general hospitals of the National Tuberculosis Association published an extensive report in 1938, which strongly recommended that such hospitals accept tuberculous patients. At that time only 177 hospitals in the United States had fully organized tuberculosis departments.

In the above cited articles by individuals, resolutions of national and international organizations and many others, various reasons for general hospitals accepting and treating tuberculosis have been presented. It has also been pointed out that such services in no way conflict or interfere with the fine sanatorium system of this country.

The need for chest disease units in general hospitals, particularly as diagnostic centers, has greatly increased in recent years because of the widespread use of chest x-ray surveys. Although x-ray shadows of lesions are never pathognomonic, large numbers of persons have had tuberculosis diagnosed and many have been sent to sanatoriums with no other evidence. Those who were proved to be nontuberculous, occupied beds intended mainly for contagious tuberculous cases, burdened already over-worked sanatorium staffs and lost confidence in diagnostic ability of their personal physicians. Persons found to have shadow-casting lesions deserve to have complete examinations to determine etiology of

their diseases. Often a period of observation is necessary while all the differential diagnostic procedures are being performed. Those proved to have nontuberculous pulmonary conditions such as bronchogenic carcinoma, bronchiectasis, etc., should be treated promptly and never sent to sanatoriums. Any well ordered general hospital should have the necessary facilities and staff members to make accurate diagnoses as promptly as possible. When operable malignancy is found there is no time to temporize. When contagious tuberculosis is found the patient should have prompt treatment in the chest disease department of a general hospital or be admitted to a sanatorium when beds are available.

All persons with significant appearing shadow-casting lesions should be under strict isolation technique until accurate diagnoses are made. In 1938 Harrington established a chest disease department at the Minneapolis General Hospital which has since been in continuous operation. Rigid isolation technique was instituted, later described by West et al., which has prevented in a remarkable manner the spread of tubercle bacilli from those proved to have tuberculosis to fellow patients and personnel, including students of nursing and medicine. Thus it has been proved that the fear of having tuberculous patients in general hospitals because of contagion is unfounded when the proper technique is used.

Ever since the late 1920's when Ralph Kinsella of St. Louis demonstrated that adequate examination for chest diseases of all patients entering a general hospital was productive of finding many unsuspected cases of various diseases of the chest, his findings have been confirmed by numerous workers such as Mills and Stewart.

In 1936 Diehl et al., instituted a tuberculosis control program in the University of Minnesota Hospitals, which consisted of most complete examinations for diseases of the chest with particular reference to tuberculosis of all patients on admission, regardless of the condition for which they were admitted or referred. A similar pre-employment examination was required and all members of the personnel, including students of nursing and medicine, were periodically examined. In 1938 Harrington instituted the same program at Minneapolis General Hospital. This program has been continuous in these two institutions with most gratifying results. Similar programs have been adopted by a considerable number of hospitals during the past decade. However, Oatway, who has done so much to promote such programs, conducted a survey which ended in September 1948, in which he found that among the 4,539 general hospitals in the United States only 247 had satisfactory programs in action.

In states where tuberculosis has become a compensable disease, a good many hospitals have been compelled to compensate their employees and courts have granted awards to persons, who, as patients, were exposed to contagious cases of tuberculosis and later fell ill from this disease. Usually any person, whether an employee or a former patient from some other cause who can show the court or the Industrial Commission that he has been exposed to contagion in a hospital and has later become ill from tuberculosis, is compensated. Therefore no hospital can afford to have contagious tuberculosis exist among its patients or personnel unless they are under rigid isolation technique. One general hospital superintendent has recently stated that he is considering the employment of a full-time medical health officer for his institution to make sure that no one is exposed to patients or personnel with contagious tuberculosis.

Apparently a serious tuberculosis problem exists in most general hospitals throughout the world. This affords one of the great opportunities of the medical profession to hasten the early control and ultimate eradication of this disease. Methods for solving this problem have long passed the theoretical or experimental stage. They are well established.

The American College of Chest Physicians has continuously supported the general hospital tuberculosis control program everywhere. To hasten the solution of the problem, Dr. James H. Stygall, Chairman of the College's Council of Tuberculosis Committees, arranged for a series of articles covering various aspects of the problem of tuberculosis in general hospitals to be published in *Diseases of the Chest*. The first, entitled "The Chest Survey in the Large General Hospital," by H. C. Ochsner, was published in April, 1951. In the present issue, "The Tuberculosis Patient in the General Hospital," is presented by James Ediin; "The Practical Use of an Isolation Ward in a General Hospital for the Treatment of Tuberculosis," by Robert E. Neff; and "Tuberculosis in General Hospitals. Need for a Control Program," by Sydney Jacobs.

These four papers contain a large volume of information by experienced workers. They are to be assembled as a pamphlet which will soon be available for distribution among physicians of the world.

J.A.M.

REFERENCES

Wilbur, Ray Lyman: "The Lag in the Health Program," *Better Health*, July, 1926.

Wahlquist, H. F. et al.: "Fifteen Reasons why General Hospitals Should Serve Tuberculous Patients," *Hospital Management*, 23:35, 1927.

"Report of Committee on the Care of Tuberculosis in General Hospitals," Charles J. Hatfield, Chairman. *Transactions of the Thirty-fourth Annual Meeting, National Tuberculosis Association*, p. 74, 1938.

West, Catherine et al.: "There is no Excuse for Tuberculous Infection," *Modern Hospital*, 59:75, 1942.

Harrington, F. E. et al.: "Personnel, Patients and Tuberculosis," *Modern Hospital*, 54:58, 1940.

Mills, W. and Stewart, C. A.: "Tuberculosis Survey in a Private Hospital," *Minnesota Medicine*, 16:22, 1933.

Diehl, H. S. et al.: "Tuberculosis Prevention, Immunization and Periodic Health Examination Among Medical Students," *J. A. Am. Med. Coll.*, 15:104, 1940.

Oatway, W. H.: "The Management of Tuberculosis in General Hospital," A Monograph published by the *Am. Hosp. Assn.*, 1940.

Oatway, W. H.: "Current Status of Routine Chest X-raying in General Hospitals of the United States," *Arizona Med.*, 6:23, 1949.

SIXTH ANNUAL POSTGRADUATE COURSE IN DISEASES OF THE CHEST

American College of Chest Physicians

St. Clair Hotel, Chicago, Illinois, September 24 - 28, 1951

Some of the physicians and lecturers who participated in the Chicago Postgraduate Course presented September 24 - 28, 1951.

College Interim Session

The Interim Session and Semi-Annual Meeting of the Board of Regents of the College will be held at the Ambassador Hotel, Los Angeles, California, on December 2 and 3, 1951. The Interim Session of the American Medical Association will be held in Los Angeles, December 4 through 7.

A scientific program, sponsored by the California Chapter of the College, will be presented on Sunday, December 2. Papers on various aspects in the treatment of pulmonary and cardiovascular disease will be presented by prominent physicians. Round table luncheon discussions and an x-ray conference of unusual films will be included. A dinner will be held on Sunday evening. The Board of Regents of the College will meet at the Ambassador Hotel on Monday, December 3.

Dr. Edward W. Hayes, Monrovia, California, is chairman of the committee on general arrangements for the meeting and Dr. Alfred Goldman, Beverly Hills, California, is serving as chairman of the committee on scientific program.

Physicians who plan to attend the College Interim Session are urged to write at once for hotel accommodations. Dr. Joseph L. Robinson, 1136 West Sixth Street, Los Angeles 14, California, is chairman of the Committee on Housing for the meeting and will be pleased to assist in obtaining hotel reservations.

The complete scientific program was published in the October issue of *Diseases of the Chest*.

Chicago Postgraduate Course

The Sixth Annual Postgraduate Course in Diseases of the Chest, sponsored by the Council on Postgraduate Medical Education and the Illinois Chapter of the College, was presented at the St. Clair Hotel, Chicago, September 24 - 28, 1951. Fifty-one physicians, representing twenty-three states, the District of Columbia and Canada, were registered.

A get-acquainted party was held for the physicians registered in the course and the participating lecturers on Monday evening, September 24, at the College building. The party was sponsored by the National Cylinder Gas Company. On Thursday evening, September 27, a dinner was held at the St. Clair Hotel, sponsored by the Illinois Chapter and the Council on Postgraduate Medical Education of the College. The dinner was preceded by a social hour sponsored by the Armour Laboratories. Dr. Otto L. Bettag, Chicago, Regent of the College, served as Toastmaster at the dinner. Dr. Edwin R. Levine, Chicago, chairman of the course, was introduced and gave a brief talk. Dr. J. Winthrop Peabody, Washington, D. C., chairman of the Council on Postgraduate Medical Education of the College, was present for the postgraduate course and was introduced at the dinner. Dr. John E. Nelson, Seattle, Washington, Governor of the College, attended the course and was appointed class valedictorian. Dr. Nelson spoke in behalf of the class as did Dr. William S. Timblim, Rockford, Illinois, who also attended the course.

Out-of-town lecturers who participated in the postgraduate course were Drs. Charles P. Bailey, Philadelphia, Andrew L. Banyai, Milwaukee,

Alvan L. Barach, New York City, John F. Briggs, St. Paul, Louis L. Friedman, Birmingham, Burgess L. Gordon, Philadelphia, Karl P. Klassen, Columbus, Jay Arthur Myers, Minneapolis, Oscar A. Sander, Milwaukee, and Maurice S. Segal, Boston.

A photograph of some of the physicians and lecturers who participated in the course appears on page 568.

College Chapter News

PENNSYLVANIA CHAPTER

A combined meeting of the Pennsylvania Chapter of the College and the Laennec Society of Philadelphia is being held at the Warwick Hotel, Philadelphia, on November 7. The following program will be presented, starting at 10:00 a. m.:

"Allergy as a Cause of Cough,"
James A. Mansmann, Pittsburgh.
"Progress in the Management of Chronic Berylliosis,"
H. E. Tebrock, New York.
"Post-Operative Medical Evaluation of 100 Cases of Commissurotomy,"
O. Henry Janton, Philadelphia.
"X-ray Conference on Interesting Cases,"
W. Edward Chamberlain, Philadelphia.
"Disorders of the Blood as They Affect the Chest X-ray Picture,"
L. M. Tocantins, Philadelphia.
"Suppurative Diseases of the Lungs,"
Edward M. Kent, Pittsburgh.
"Practical Application of Anatomy to Diseases of the Chest,"
Oscar V. Batson, Philadelphia.

John V. Foster, Secretary.

NEW JERSEY CHAPTER

The Fall Meeting of the New Jersey Chapter of the College will be held at the Valley View Sanatorium, Paterson, November 20, 1951. Dr. Edgar Mayer of New York City will be the guest speaker on the program beginning at 9:00 that evening. He will speak on "Recent Advances in the Management of Chronic Pulmonary Diseases."

Irving J. Selikoff, Secretary.

ROCKY MOUNTAIN CHAPTER

The annual meeting of the Rocky Mountain Chapter of the College, held jointly with the Colorado Trudeau Society, took place at the Shirley Savoy Hotel, Denver, September 22, 1951. An interesting scientific program was presented which was well attended. Out-of-town lecturers who presented papers were Dr. Charles K. Petter, Waukegan, Illinois, Assistant Treasurer of the College, whose subject was "An Evaluation of Treatment Methods in Tuberculosis," and Dr. Theodore Noehren, Salt Lake City, who spoke on "Review of Chest Lesions from the Salt Lake City Mass Chest X-ray Survey."

At the business meeting of the chapter, the following officers were elected for the coming year:

W. Bernard Yegge, Denver, President
Carl W. Tempel, Denver, Vice-President
B. Thomas McMahon, Denver, Secretary-Treasurer.

B. Thomas McMahon, Secretary.

WISCONSIN CHAPTER

The Wisconsin Chapter of the College held its annual meeting at the Schroeder Hotel, Milwaukee, on Sunday, September 30. An excellent scientific program was presented which was attended by approximately two hundred physicians.

A luncheon and business meeting of the chapter was attended by the following out-of-town guests: Dr. Chevalier L. Jackson, Philadelphia, President of the College; Dr. Jay Arthur Myers, Minneapolis; Dr. Burgess L. Gordon, Philadelphia; Dr. Edwin R. Levine, Chicago; and Mr. Murray Kornfeld, Chicago, Executive Secretary of the College.

The following officers of the chapter were elected for the coming year:

Mischa J. Lustok, Milwaukee, President
Oscar A. Sander, Milwaukee, Vice-President
Leon H. Hirsh, Milwaukee, Secretary-Treasurer.

Leon H. Hirsh, Secretary.

College News Notes

At the combined meeting of the Blair and Cambria County Medical Societies on Thursday, October 4, at the Cresson Sanatorium, Dr. Burgess L. Gordon, Philadelphia, Regent of the College, presented a paper on "Advances in the Study and Treatment of Silicosis." Dr. Ross K. Childerhose, Harrisburg, Governor of the College for Pennsylvania, discussed "The Management of the Minimal Case of Tuberculosis," and Dr. Edward M. Kent, Pittsburgh, Fellow, presented the topic "Extrapleural Pneumonectomy in Pulmonary Tuberculosis."

Dr. Sidney H. Dressler, formerly Assistant Medical Director of the National Jewish Hospital at Denver, has been elevated to Medical Director of the hospital.

Dr. Aldo A. Luisada has been promoted from Assistant Professor to Associate Professor of Medicine at the Chicago Medical School.

ANNUAL POSTGRADUATE COURSE IN ALLERGY

Sponsored by the American College of Allergists, the annual Graduate Instructional Course will be held at the Hotel William Penn, Pittsburgh, April 4, 5, 6, preceding the Eighth Annual Session of the College. The instructional course is arranged as a practical refresher course for the busy practicing allergist as well as for the student allergist. There will be elective round table discussion with luncheons at noon each day. A new, special feature is a half-day symposium on industrial allergy. The course is open to all physicians. Tuition is $35.00. Application should be made to the office of the American College of Allergists, 401 La Salle Medical Building, Minneapolis 2, Minnesota.

Obituaries

WILL ROSS

1888 - 1951

Few persons without formal medical training have done as much as Will Ross in the tuberculosis eradication compaign. He was born in Appleton, Wisconsin, in 1888. At the age of approximately one year, his parents moved to a house in which a death from tuberculosis had recently occurred. They purchased some of the household effects, including the rugs, on which the baby spent creeping and crawling days. He was apparently in good health until his junior year in high school when he developed what appeared to be pneumonia. He did not completely recover although he finished high school and went West to an out-of-door job.

Upon his return, he appeared to be in good health and became a cub reporter on a local newspaper in his home town. It was not long until a definite diagnosis of tuberculosis was made and he was promptly hurried off to the Southwest to "take it easy." In a few months he took a strenuous position as police reporter on a daily newspaper, but soon he grew steadily weaker and returned to Wisconsin. He entered River Pines Sanatorium at Stevens Point to "try it out for a week." The week stretched to five years. Later, the famous chest physician, Hoyt E. Dearholt, of Milwaukee, stated that Will Ross was the sickest person he had ever seen get well from tuberculosis.

Toward the end of his sanatorium experience, Will Ross began one of the finest demonstrations of personal rehabilitation ever recorded. He first did a small amount of office work in the sanatorium to help pay his way. He then started a store on the sanatorium grounds, with a small stock of postcards, stationary, needles, thread, etc., for patients. In 1913, he erected a small building adjacent to the Wisconsin State Sanatorium which, with the land, cost him $500.00. He had to borrow another $500.00 to purchase a limited stock of merchandise. He started to supply sanatoriums with their paper needs by mail. A napkin project provided encouragement and he soon added paper tray covers, sputum cups, etc. In 1919 he moved his little store into two small rooms in Milwaukee. The enterprise expanded until he had 65,000 square feet of floor space and more than 300 employees in one of the finest hospital supply houses to be found anywhere. Here, Will Ross helped to rehabilitate many persons with tuberculosis.

He was a keen student of this disease and was extremely valuable in

the campaign to eradicate it, not only because of his large store of knowledge but also because he was always willing to give so freely of his time and himself. In his home state he was always engaged in the work of the Anti-Tuberculosis Association, serving for a while on the active staff, the Board of Directors and in numerous other capacities. Will Ross was one of the most substantial members of the Mississippi Valley Conference on Tuberculosis from its beginning. He served on nearly all of its committees and the Governing Council. In 1942 he was president, and in 1943 he was granted the Hoyt E. Dearholt Medal—the highest award of the organization.

Will Ross was widely known nationally. He served on nearly every committee of the National Tuberculosis Association, including the Executive Committee. In 1944 he was elected president, being one of two nonmedical men elected to this high office since the Association was organized in 1904. His election was greeted with enthusiastic approval by physicians as well as lay workers everywhere. Being a forceful speaker, he was invited to participate in numerous tuberculosis programs. He published many articles, the last of which appeared in the *American Journal of Nursing* a few weeks before he died. Shortly before Hoyt Dearholt died, he wrote that Will Ross' career had been one of the most romantic in history.

He apparently was infected with tubercle bacilli in infancy, developed first clinical manifestations as a junior high school student, went West twice for his health, entered a sanatorium when almost at death's door, required five years of treatment and won a complete victory over tuberculosis for the remainder of his life. His personal rehabilitation record was phenomenal, from a small amount of sanatorium office work to help pay for board and room, a tiny sanatorium store, to one of the world's finest hospital supply firms. He gave so liberally of his time and energy that he became one of the world's most outstanding civic leaders and crusaders against tuberculosis.

His death on May 31, 1951, resulted from malignancy. Probably no nonmedical crusader against tuberculosis has been more widely and favorably known by so many chest physicians. With his death, the medical profession lost one of its longest serving and most thoroughly efficient allies. The profession is manifesting its great appreciation by promoting and perpetuating some of the fine projects he initiated and carrying out many splendid ideas which originated in his mind.

STEPHEN ANTHONY PAROWSKI

1899 - 1950

Dr. Stephen A. Parowski died on October 9, 1950, following a protracted illness. Dr. Parowski was born in 1899. He graduated from Rush Medical College in 1926 and took his internship at Boston Naval Hospital in Chelsea, Massachusetts, in 1926 and 1927.

Dr. Parowski went to San Diego County as Medical Director of Vauclain Home in 1928. There he modernized the treatment and gained the respect of all the clinicians in the community for his ability in his chosen field of internal medicine. Dr. Parowski was a Charter Member of the American College of Chest Physicians. His death is considered as a very real, personal loss to all his close friends and his many patients.

Buford H. Wardrip, Governor for California.

JOSEPH SCHWARZ

1899 - 1949

Dr. Joseph Schwarz was born in Hungary, October 26, 1899. He studied in Vienna, Paris and Hungary, receiving his medical degree in 1926 from the Royal Hungarian University. He practiced in Hungary until 1930 when he emigrated to the United States. Dr. Schwarz was resident physician at the Municipal Sanatorium, Otisville, New York, from 1931 to 1934. He entered private practice in the Bronx, New York City, in 1935. At the time of his death he was visiting physician to the chest clinic at the Lincoln Hospital and to the Riverside Hospital for Tuberculosis. Dr. Schwarz was also a member of the staff of the Lower Harlem Chest Clinic of the Department of Health.

During the war, Dr. Schwarz served as an examining physician for the Selective Service Board. He was a Charter Member of the American Academy of General Practice and a member of the Bronx County Medical Society, as well as a Fellow of the American College of Chest Physicians.

Dr. Schwarz died on February 25, 1949, after a brief illness.

Foster Murray, Governor for New York State.

NORMAN W. HEYSETT

1904 - 1949

Dr. Norman W. Heysett, son of Dr. E. N. Heysett, was born April 7, 1904, in Baldwin, Michigan.

He attended Ludington, Michigan High School and was graduated in premedical work at Wabash College in 1925. He was graduated from Indiana University Medical School in 1929 and served his internship at City Hospital, Indianapolis, Indiana.

During his school years he became a member of Phi Gama Delta and Nu Sigma Nu fraternities.

In 1931 he engaged in medical practice at Hart, Michigan, where he became a highly respected member of the community in professional and civic affairs. Because of poor health he then retired from general practice and became associated with Dr. Jerome R. Head at Edward Sanatorium, Naperville, Illinois. Following this, for about three years, until his untimely death on September 6, 1949, he was a member of the medical staff at Irene Byron Sanatorium, Fort Wayne, Indiana.

Surviving relatives were his wife, Alice, and a sister, Mrs. Frank Ritchey of Fort Wayne.

Dr. Heysett was a member of the Allen (Indiana) County Medical Society, Indiana Medical Society, American Medical Association and American College of Chest Physicians.

Jerome V. Pace, Governor for Indiana.

COLLEGE EVENTS

Interim Session, American College of Chest Physicians, Ambassador Hotel, Los Angeles, California, December 2-3, 1951.

Pennsylvania Chapter and Laennec Society Joint Meeting, Philadelphia, November 7, 1951.

Southern Chapter Meeting, Dallas, Texas, November 4-5, 1951.

New York City Postgraduate Course, November 12-17, 1951.

New Jersey Chapter Meeting, Paterson, November 20, 1951.

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The Workmen's Circle Sanatorium, Liberty, New York. A modern thoroughly equipped institution situated in the heart of the Catskills, for treatment of tuberculosis and other diseases of the lungs. Rates are $45.00 per week inclusive of all charges. For further information write to

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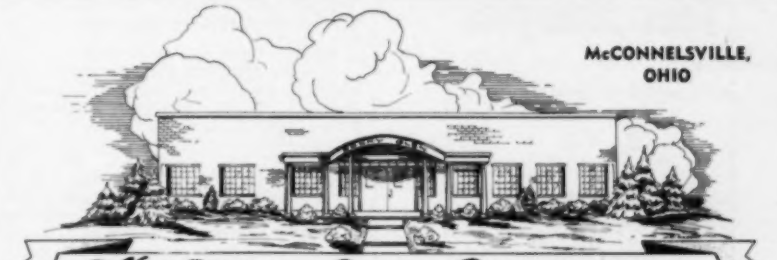
Supt. and Medical Director



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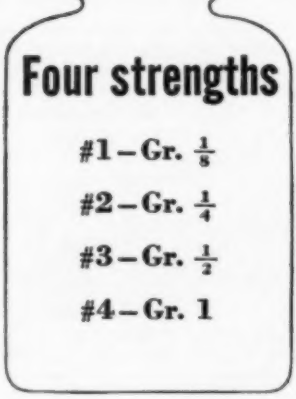

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MEDICAL SERVICE BUREAU

POSITIONS AVAILABLE

Senior resident physician wanted for 200-bed tuberculosis sanatorium near Philadelphia. Approved A. M. A. Full Maintenance. Salary open. Please address Box 226A, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

Applications are invited for positions of Resident and Assistant Resident at Grace Dart Home Hospital, 6085 Sherbrooke Street, East, Montreal. This is a 145 bed tuberculosis hospital, approved by the American College of Surgeons, and covers all aspects of medical and surgical treatment. Duties to commence July 1, 1952. Apply to Medical Director.

Staff physicians. Modern 380-bed tuberculosis hospital. Metropolitan area. Man or woman acceptable, must be U. S. citizen, graduate of approved school, eligible for Ohio license. Salary depends on training—up to $6,000 plus maintenance. Address Box 236A, American College of Chest Physicians, 112 East Chestnut St., Chicago 11, Ill.

Two staff physicians wanted for 114-bed sanatorium situated in Delaware including full maintenance. Salary open. Please address Box 237A, American College of Chest Physicians, 112 East Chestnut St. Chicago 11, Ill.

POSITIONS WANTED

Experienced and well trained chest specialist desirous of appointment as medical director or assistant medical director of a tuberculosis hospital. Now holding a responsible position, but contemplating change. Outstanding references. Class "A" American school graduate and native born. Please address Box 258B, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

Chest specialist interested in private practice as an associate. Well trained and experienced. Class "A" American school graduate. Native born. Now holding a position of responsibility. References are outstanding. Please address Box 259B, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

Physician desires residency in tuberculosis medical service. Hospital or sanatorium. Previous training in tuberculosis. Rotating internship. Please address Box 260B, American College of Chest Physicians, 112 East Chestnut Street, Chicago 11, Illinois.

THE STATUS OF NURSES

Resolution

Adopted by the Commission on the Status of Women

World Health Organization

The Commission on the Status of Women,

Having considered the report of the first session of the Committee of Experts of the World Health Organization communicated to the Commission by the Secretary-General in conformity with Article III of the Agreement between the United Nations and the World Health Organization;

Expressing its thanks to the said Organization and to the Committee of Experts for transmitting the said report, which deals with all the aspects of the training and status of nurses; and hoping that the widest possible publicity will be given to the report;

Realizing that, according to the said report, the shortage of qualified nursing staff is hampering the application and progress of all programmes relating to health and hygiene; and

Believing that any measures which will improve the status of nurses will improve the status of women generally,

In order to achieve, in countries where the services are well organized, the ratio necessary to meet the needs of hospitals and services for public health and,

In order to create in other countries an awareness of the urgent need for professional and auxiliary training, so as to remedy the existing extreme inadequacy of such services in those countries,

Requests the Secretary-General

To draw the attention of Member States to the importance of ensuring:

(a) wider recognition for the professional status of nurses, and

(b) legal protection for this status, and

To recommend to non-governmental organizations to give their co-operation to Governments and professional associations of nurses for these purposes.

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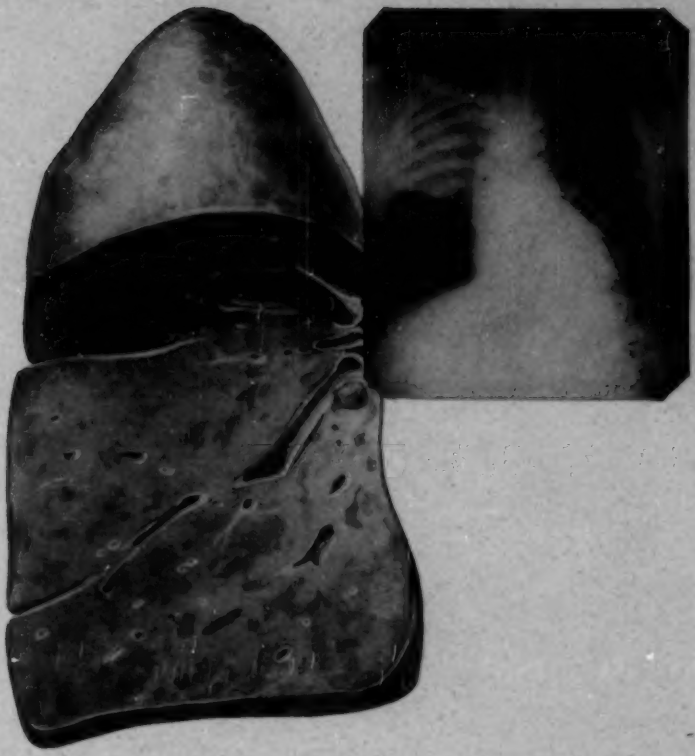

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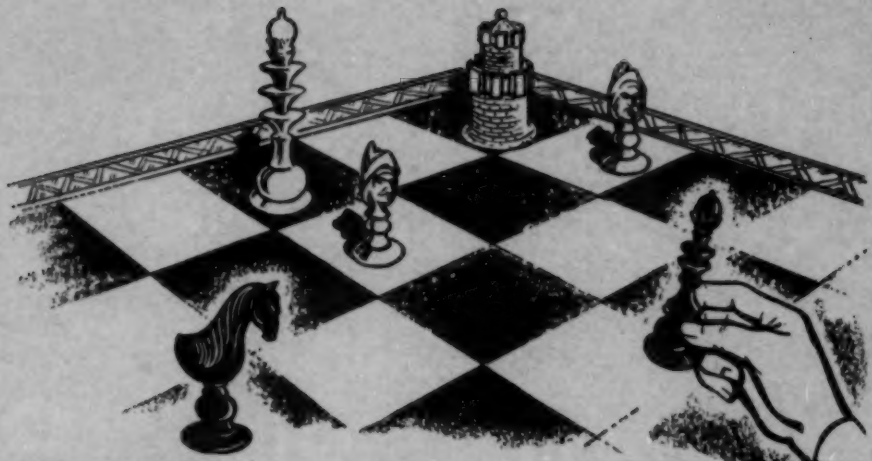

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*TEMPEL, C. W., FREDERIC, J. H. Jr., MARDIS, R. C., TOWBIN, M. N., and DYE, W. E. Combined intermittent regimens employing streptomycin and PAS, Am. Rev. Tubere., 1951, 63, 295

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